AD A-116 407

SPECIAL REPORT ARLCB-SP-82006

TECHNICAL LIBRARY

INDEX TO BENET WEAPONS LABORATORY (LCWSL) TECHNICAL REPORTS - 1981

R. D. Neifeld Technical Publications and Editing Unit



April 1982

US ARMY ARMAMENT RESEARCH AND DEVELOPMENT COMMAND
LARGE CALIBER WEAPON SYSTEMS LABORATORY
BENÉT WEAPONS LABORATORY
WATERVLIET, N. Y. 12189

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED

DISCLAIMER

The findings in this report are not to be construed as an official Department of the Army position unless so designated by other authorized documents.

The use of trade name(s) and/or manufacture(s) does not constitute an official indorsement or approval.

DISPOSITION

Destroy this report when it is no longer needed. Do not return it to the originator.

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM		
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER		
ARLCB-SP-82006				
4. TITLE (and Subtitle)		S. TYPE OF REPORT & PERIOD COVERED		
INDEX TO BENET WEAPONS LABORATORY TECHNICAL REPORTS - 1981	(LCWSL)	ex e		
		6. PERFORMING ORG. REPORT NUMBER		
7. AUTHOR(s)		8. CONTRACT OR GRANT NUMBER(s) .		
R. D. Neifeld				
9. PERFORMING ORGANIZATION NAME AND ADDRESS U.S. Army Armament Research & Deve Benet Weapons Laboratory, DRDAR-LC Watervliet, NY 12189		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS		
11. CONTROLLING OFFICE NAME AND ADDRESS		12. REPORT DATE		
U.S. Army Armament Research & Deve		April 1982		
Large Caliber Weapon Systems Labor	atory	13. NUMBER OF PAGES		
Dover, NJ 07801	t from Controlling Office)	113 IS. SECURITY CLASS. (of this report)		
14. MONITORING AGENCY NAME & ADDRESS(I MINERAL	. Hom Guntoning Gines,	UNCLASSIFIED		
		15a. DECLASSIFICATION/DOWNGRADING		
		SCHEDULE		
16. DISTRIBUTION STATEMENT (of this Report)				
Approved for public release; distribution unlimited.				
17. DISTRIBUTION STATEMENT (of the abstract entered	in Block 20, if different fro	in Kepon)		
18. SUPPLEMENTARY NOTES				
19. KEY WORDS (Continue on reverse side if nacessary an	d identify by block number))		
Benet Weapons Laboratory				
Technical Publications		U		
Bibliography				
Abstracts				
Document Control Data				
20. ABSTRACT (Continue on reverse state if necessary and identify by block number) This is a compilation of Benet Weapons Laboratory technical reports published during 1981.				
	•			
i				

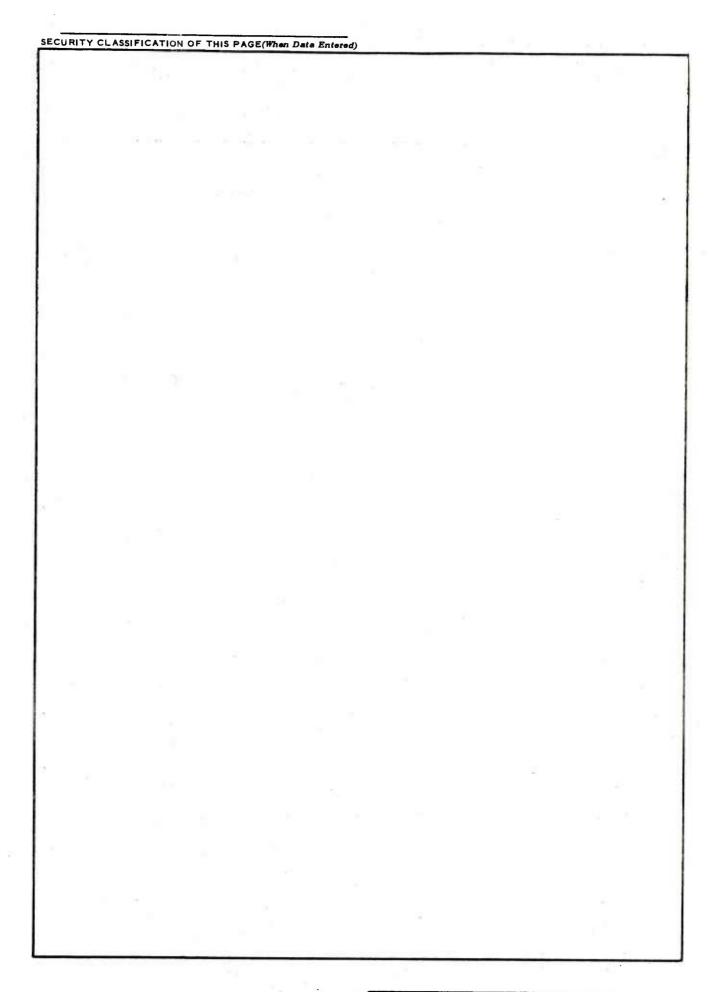


TABLE OF CONTENTS

		Page
LIST OF REPORTS		1
AUTHOR INDEX		5
SUBJECT INDEX		9
AD NUMBERS		18
ABSTRACTS-REPORT DOCUMENTATION PAGE (DD FORM 1473)		21

TECHNICAL REPORTS 1981

REPORT NUMBER	TITLE	AUTHOR	DATE
ARLCB-TR-81001	The Microstructural and Property Changes of LASER Treated Electrodeposits	V.P. Greco	Jan 81
ARLCB-TR-81002	Computation Schemes for Sensitivity Coefficient of Exterior Ballistics with Velocity Square Damping	C.N. Shen J.J. Wu	Jan 81
ARLCB-TR-81003	Reinforcement of FeCrAlY with Silicon Carbide (Carbon Core) Filament	I. Ahmad D.N. Hill J. Barranco R. Warenchak W. Heffernan	Jan 81
ARLCB-SP-81004	Computer User Guide for IBM 4341	J. Pascale R. Romano	Jan 81
ARLCB-TR-81005	Residual Stress Redistribution Caused by Notches and Cracks in a Partially Autofrettaged Tube	S.L. Pu M.A. Hussain	Jan 81
ARLCB-TR-81006	A Critical Review of the Dry Friction and Compressible Fluid Recoil/Counter-Recoil Concepts	H.J. Sneck	Feb 81
ARLCB-TR-81007	Service Simulation Test System for Kinetic Energy Penetrator Projectiles	M.A. Scavullo J.H. Underwood	Feb 81
ARLCB-TR-81008	A Photoelastic Study of Stresses in Single-Groove Connections of the Same Material	Y.F. Cheng	Feb 81
ARLCB-SP-81009	Posture Report - FY 1980	Coordinated by: Plans & Resources Section, Benet Weapons Lab	Mar 81
AŖLCB-TR-81010	Thermal and Structural Analysis of the Effects of Chlorine Impurities on Pressurized Cadmium Sulfide	P.J. Cote G.P. Capsimalis C.G. Homan	Mar 81
ARLCB-TR-81011	Study of Erosion Resistant Materials for Gun Tubes Part II: Tantalum Coated Liners	R.L. Cullinan G. D'Andrea P. Croteau	Apr 81

TECHNICAL REPORTS 1981 (CONT.)

REPORT NUMBER	TITLE	AUTHOR	DATE
ARLCB-TR-81012	The Correlation of Fracture Toughness with Charpy V-Notch Impact Test Data	S. Tauscher	Mar 81
ARLCB-TR-81013	Main Armament Concepts for a Near Term Future Main Battle Tank	J.K. Jorczak	Mar 81
ARLCB-MR-81014	An In-Process Thickness Determination During Electroplating or Electropolishing by the Ultrasonic Pulse-Echo Technique	J. Frankel W.J. Korman G.P. Capsimalis	Apr 81
ARLCB-TR-81015	Computer Controlled Ultrasonic Inspection of Cannon Tubes	M. Johnson	Apr 81
ARLCB-TR-81016	Basic Mechanics of De Bange Obturator Split Ring Prestressing	D.F. Finlayson	Apr 81
ARLCB-TR-81017	Evaluation of Modified Bore Erosion Gage	G. Capsimalis R. Williams G. D'Andrea	May 81
ARLCB-TR-81018	Fatigue and Fracture Tests of Gas Bottle Material	J.H. Underwood J.J. Zalinka	May 81
ARLCB-TR-81019	Numerical Prediction of Residual Stresses in an Autofrettaged Tube of Compressible Material	P.C.T. Chen	May 81
ARLCB-TR-81020	Superconductivity in Pressure Quenched Cadmium Sulfide at 77 K	C.G. Homan K. Laojindapun R.K. MacCrone	May 81
ARLCB-MR-81021	A Four Point Bending Experiment	R.V. Milligan V.J. Olmstead	Jun 81
ARLCB-TR-81022	A Rational Function Approximation for the Integration Point in Exponentially Weighted Finite Element Methods	J.E. Flaherty	Jun 81
ARLCB-TR-81023	The Effect of Prebore Quench Time on the Depth and Uniformity of Hardening in 105mm M68 Gun Tube Forging	J. Passmore D.G. Baldrey	- Jul 81

TECHNICAL REPORTS 1981 (CONT.)

REPORT NUMBER	TITLE	AUTHOR	DATE
ARLCB-TR-81024	A Comparison of Three Point and Four Point Loading in Elastic-Plastic Bending of Beams	R.V. Milligan	Jun 81
ARLCB-TR-81025	Moment-Strain Relationships in Elastic-Plastic Bending of Beams	R.V. Milligan	Jun 81
ARLCB-TR-81026	Regenerative Liquid Propellant Gun Technology	R.G. Hasenbein	Jun 81
ARLCB-TR-81027	Stress Intensity Factors for Radial Cracks in a Partially Autofrettaged Thick-Wall Cylinder	S.L. Pu M.A. Hussain	Ju1 81
ARLCB-TR-81028	Structural Analysis of a Kinetic Energy Projectile During Launch	G.A. Pflegl J.H. Underwood G.P. O'Hara	Jul 81
ARLCB-TR-81029	Low Frequency Induction Heating of Large Diameter Steel Preforms for Rotary Forging	D. Concordia	Jul 81
ARLCB-SP-81030	Index to Benet Weapons Laboratory (LCWSL) Technical Reports - 1980	R.D. Neifeld	Jul 81
ARLCB-TR-81031	Numerical Solution to Beam Vibra- tions Under a Moving Couple	J.J. Wu	Aug 81
ARLCB-TR-81032	Safe Service Life Testing of the 155 MM M185 Howitzer Barrel with M203 Propelling Charge	B.B. Brown H.D. McAlonie	Aug 81
ARLCB-TR-81033	Process and Procedure Guide for the "Pump Thru" Method of Chromium Plating 120 MM XM256 Gun Bores	G. D'Andrea V.P. Greco J. Walden	Oct 81
ARLCB-TR-81034	A New Variational Method for Initial Value Problems, Using Piecewise Hermite Polynomial Spline Functions	C.N. Shen J.J. Wu	Aug 81
ARLCB-TR-81035	Activation of Superalloys and Stainless Steels for Chromium Plating	W. Baldauf E.S. Chen	Aug 81

TECHNICAL REPORTS 1981 (CONT.)

REPORT NUMBER	TITLE	AUTHOR	DATE
ARLCB-TR-81036	Automated Plating of Large Caliber Guns - Application of Computer Con- trol to "Pump Thru" Plating Systems	J.A. Walden	Sep 81
ARLCB-TR-81037	Fatigue Performance Comparison of Rotary Forged and Conventionally Forged Cannon Barrels (105 MM M68)	B.B. Brown H.D. McAlonie	Sep 81
ARLCB-TR-81038	Elastic-Plastic Thick-Walled Tubes Subjected to Internal Pressure and Temperature Gradient	P.C.T. Chen	Sep 81
ARLCB-TR-81039	Fabrication and Characterization of Tungsten Wire Reinforced U-0.75 Ti Alloy Composites	I. Ahmad J. Barranco R.J. Fiorentino J. Mescall G. Bishop E. Roecker	Sep 81
ARLCB-TR-81040	On Elastic-Plastic Analysis of an Overloaded Breech Ring Using NASTRAN	P.C.T. Chen	Sep 81
ARLCB-TR-81041	Fracture Toughness of 105mm M68 Tubes	F.A. Heiser	Oct 81
ARLCB-TR-81042	155mm M199 Firing Train Test	R. Fiscella R. Carroll	Oct 81
ARLCB-TR-81043	Method of Solution for Variational Principle Using Bicubic Hermite Polynomial	C.N. Shen	Nov 81
ARLCB-TR-81044	Thermo-Elastic-Plastic Stresses in Multi-Layered Cylinders	J.D. Vasilakis	Nov 81
ARLCB-TR-81045	Superconductivity in Hydrogen- Charged Copper-Implanted Palladium	A. Leiberich W. Scholz W.J. Standish C.G. Homan	Dec 81
ARLCB-TR-81046	Study of Erosion Resistant Materials for Gun Bores Part III: Low Contraction (LC) Chromium Plated Liners	R.L. Cullinan G. D'Andrea P. Croteau	Dec 81

AUTHOR INDEX--1981

AUTHOR	REPORT NUMBER
Ahmad, I.	 ARLCB-TR-81003 ARLCB-TR-81039
Baldauf, W.	ARLCB-TR-81035
Baldrey, D.G.	ARLCB-TR-81023
Barranco, J.	ARLCB-TR-81003 ARLCB-TR-81039
Bishop, G.	ARLCB-TR-81039
Brown, B.B.	ARLCB-TR-81032 ARLCB-TR-81037
Capsimalis, G.P.	ARLCB-TR-81010 ARLCB-MR-81014 ARLCB-TR-81017
Carroll, R.	ARLCB-TR-81042
Chen, E.S.	ARLCB-TR-81035
Chen, P.C.T.	ARLCB-TR-81019 ARLCB-TR-81038 ARLCB-TR-81040
Cheng, Y.F.	ARLCB-TR-81008
Concordia, D.	ARLCB-TR-81029
Cote, P.J.	ARLCB-TR-81010
Croteau, P.	ARLCB-TR-81011 ARLCB-TR-81046
Cullinan, R.L.	ARLCB-TR-81011 ARLCB-TR-81046
D'Andrea, G.	ARLCB-TR-81011
	ARLCB-TR-81017 ARLCB-TR-81033 ARLCB-TR-81046
Finlayson, D.F.	ARLCB-TR-81016
Fiorentino, R.J.	ARLCB-TR-81039

AUTHOR INDEX--1981 (CONT.)

AUTHOR	REPORT NUMBER
Fiscella, R.	ARLCB-TR-81042
Flaherty, J.E.	ARLCB-TR-81022
Frankel, J.	ARLCB-MR-81014
Greco, V.P.	ARLCB-TR-81001 ARLCB-TR-81033
Hasenbein, R.G.	ARLCB-TR-81026
Heffernan, W.	ARLCB-TR-81003
Heiser, F.A.	ARLCB-TR-81041
Hill, D.N.	ARLCB-TR-81003
Homan, C.G.	ARLCB-TR-81010 ARLCB-TR-81020 ARLCB-TR-81045
Hussain, M.A.	ARLCB-TR-81005 ARLCB-TR-81027
Johnson, M.	ARLCB-TR-81015
Jorczak, J.K.	ARLCB-TR-81013
Korman, W.J.	ARLCB-MR-81014
Laojindapun, K.	ARLCB-TR-81020
Leiberich, A.	ARLCB-TR-81045
MacCrone, R.K.	ARLCB-TR-81020
McAlonie, H.D.	ARLCB-TR-81032 ARLCB-TR-81037
Mescall, J.	ARLCB-TR-81039
Milligan, R.V.	ARLCB-MR-81021 ARLCB-TR-81024 ARLCB-TR-81025
Neifeld, R.D.	ARLCB-SP-81030
O'Hara, G.P.	ARLCB-TR-81028

AUTHOR INDEX--1981 (CONT.)

AUTHOR	REPORT NUMBER
Olmstead, V.J.	ARLCB-MR-81021
Pascale, J.	ARLCB-SP-81004
Passmore, J.	ARLCB-TR-81023
Pfleg1, G.A.	ARLCB-TR-81028
Coordinated by: Plans & Resources Section Benet Weapons Laboratory	ARLCB-SP-81009
Pu, S.L.	ARLCB-TR-81005 ARLCB-TR-81027
Roecker, E.	ARLCB-TR-81039
Romano, R.	ARLCB-SP-81004
Scavullo, M.A.	ARLCB-TR-81007
Scholz, W.	ARLCB-TR-81045
Shen, C.N.	ARLCB-TR-81002 ARLCB-TR-81034 ARLCB-TR-81043
Sneck, H.J.	ARLCB-TR-81006
Standish, W.J.	ARLCB-TR-81045
Tauscher, S.	ARLCB-TR-81012
Underwood, J.H.	ARLCB-TR-81007 ARLCB-TR-81018 ARLCB-TR-81028
Vasilakis, J.D.	ARLCB-TR-81044
Walden, J.A.	ARLCB-TR-81033 ARLCB-TR-81036
Warenchak, R.	ARLCB-TR-81003
Williams, R.	ARLCB-TR-81017

AUTHOR INDEX--1981 (CONT.)

AUTHOR	REPORT NUMBER
Wu, J.J.	ARLCB-TR-81002 ARLCB-TR-81031 ARLCB-TR-81034
Zalinka, J.J.	ARLCB-TR-81018

SUBJECT INDEX--1981

SUBJECT	REPORT NUMBER
Abstracts	ARLCB-SP-81030
Activation	ARLCB-TR-81035
Adhesion	ARLCB-TR-81035
Adjoint System	ARLCB-TR-81043
Adjoint System Far End Value	ARLCB-TR-81034
Autofrettaged Tube	ARLCB-TR-81005 ARLCB-TR-81019
Ballistics with Drag	ARLCB-TR-81002
Barrel	ARLCB-TR-81032
Barsom-Rolfe Correlation	ARLCB-TR-81012
Beam Vibrations	ARLCB-TR-81031
Beams	ARLCB-TR-81024 ARLCB-TR-81025
Bending	ARLCB-TR-81024 ARLCB-TR-81025
Benet Weapons Laboratory	ARLCB-SP-81030
Bibliography	ARLCB-SP-81030
Bicubic Hermite Polynomial	ARLCB-TR-81043
Bilinear Concomitant	ARLCB-TR-81034 ARLCB-TR-81043
Bore Erosion Gage	ARLCB-TR-81017
Bore Plating	ARLCB-TR-81011 ARLCB-TR-81046
Bore Quench	ARLCB-TR-81023
Breech Ring	ARLCB-TR-81040
Cadmium Sulfide	ARLCB-TR-81010 ARLCB-TR-81020

SUBJECT	REPORT NUMBER
Calorimetry	ARLCB-TR-81010
Cannon	ARLCB-TR-81015 ARLCB-TR-81032
Cannon Barrel	ARLCB-TR-81037
Central Processor	ARLCB-SP-81004
Charpy Impact Test	ARLCB-TR-81012
Chemical Vapor Deposition	ARLCB-TR-81003
Chromium	ARLCB-TR-81001 ARLCB-TR-81033 ARLCB-TR-81036
Chromium Plating	ARLCB-TR-81035
Coextrusion	ARLCB-TR-81039
Combustion	ARLCB-TR-81026
Combustion Instability	ARLCB-TR-81026
Composites	ARLCB-TR-81039
Compressible Fluid Recoil System	ARLCB-TR-81006
Computational Scheme	ARLCB-TR-81002
Computer	ARLCB-TR-81033 ARLCB-TR-81036
Contact Stresses	ARLCB-TR-81008
Controller	ARLCB-TR-81033 ARLCB-TR-81036
Convection-Diffusion Problems	ARLCB-TR-81022
Correlation	ARLCB-TR-81012
Cylinder	ARLCB-TR-81018
De Bange Obturator	ARLCB-TR-81016

SUBJECT	REPORT NUMBER
Deflections .	ARLCB-MR-81021
Depleted Uranium	ARLCB-TR-81039
Diamagnetism	ARLCB-TR-81020
Differential Scanning	ARLCB-TR-81010
Diffusion Bonding	ARLCB-TR-81003
Document Control Data	ARLCB-SP-81030
Dry-Friction Recoil System	ARLCB-TR-81006
8620 Stee1	ARLCB-TR-81023
Elastic-Plastic	ARLCB-TR-81038 ARLCB-TR-81040
Elastic-Plastic Analysis	ARLCB-TR-81024
Elastic-Plastic Deformation	ARLCB-TR-81016 ARLCB-TR-81019 ARLCB-TR-81025
Electro Slag Refining	ARLCB-TR-81041
Electrodeposition	ARLCB-TR-81035
Electrodeposits	ARLCB-TR-81001
Electroplated Thickness	ARLCB-MR-81014
Electroplating	ARLCB-MR-81014
Electropolished Thickness	ARLCB-MR-81014
Energy	ARLCB-TR-81042
Erosion Protection	ARLCB-TR-81011 ARLCB-TR-81046
Exponential-Weights	ARLCB-TR-81022
Failure ,	ARLCB-TR-81007
Fatigue	ARLCB-TR-81018 ARLCB-TR-81037

SUBJECT	REPORT NUMBER
Fatigue Cracks	ARLCB-TR-81015 ARLCB-TR-81032
Fatigue Failure	ARLCB-TR-81032
Fatigue Life	ARLCB-TR-81018 ARLCB-TR-81032
Fatigue Test	ARLCB-TR-81032 ARLCB-TR-81037
FeCrAlY Alloy	ARLCB-TR-81003
Finite-Difference Method	ARLCB-TR-81019 ARLCB-TR-81038
Finite Element	ARLCB-TR-81031 ARLCB-TR-81034 ARLCB-TR-81040
Finite Element Method	ARLCB-TR-81022
Firing Mechanism	ARLCB-TR-81042
Firing Pin	ARLCB-TR-81042
Fracture	ARLCB-TR-81007 ARLCB-TR-81018 ARLCB-TR-81028
Fracture Mechanics	ARLCB-TR-81005 ARLCB-TR-81027
Fracture Toughness	ARLCB-TR-81032 ARLCB-TR-81037 ARLCB-TR-81041
Groove Connections	ARLCB-TR-81008
Gun Dynamics	ARLCB-TR-81031
Gun Tube Erosion	ARLCB-TR-81011 ARLCB-TR-81046
Gun Tubes	ARLCB-MR-81021
Guns	ARLCB-TR-81033 ARLCB-TR-81036

SUBJECT	REPORT NUMBER
Hardenability .	ARLCB-TR-81023
High Strength Steel	ARLCB-TR-81023
High Temperature Mechanical Properties	ARLCB-TR-81003
Hollow Tube Forging	ARLCB-TR-81023
Howitzer	ARLCB-TR-81032
IBM 4341 Computer	ARLCB-SP-81004
Ignition	ARLCB-TR-81026
Induction Heating	ARLCB-TR-81029
Initial-Boundary Value Problem	ARLCB-TR-81043
Initial Value Problems	ARLCB-TR-81034
Initial Velocity and Elevation Angle Correction	ARLCB-TR-81002
Integral Weapon Feeder	ARLCB-TR-81013
Internal Pressure	ARLCB-TR-81038
Ion Implantation	ARLCB-TR-81045
Iteration Procedure	ARLCB-TR-81002
KE Penetrator	ARLCB-TR-81039
Large Caliber	ARLCB-TR-81033 ARLCB-TR-81036
LASER	ARLCB-TR-81001
Linear Regression	ARLCB-TR-81012
Liquid Propellant Guns	ARLCB-TR-81026
Liquid Propellants	ARLCB-TR-81026
Load Relief Factor	ARLCB-TR-81027
Low Contractile Chromium	ARLCB-TR-81046

SUBJECT	REPORT NUMBER
Magnetic Field	ARLCB-TR-81029
Magnetic Flux	ARLCB-TR-81029
Maximum Fillet Stresses	ARLCB-TR-81008
Metal Matrix Composites	ARLCB-TR-81003
Microprocessor	ARLCB-TR-81033 ARLCB-TR-81036
Minicomputer	ARLCB-TR-81015
Misfire	ARLCB-TR-81042
Moving Load	ARLCB-TR-81031
Multi-Layered Cylinders	ARLCB-TR-81044
Multiple Cracks	ARLCB-TR-81027
NASTRAN Code	ARLCB-TR-8104()
Nondestructive Testing	ARLCB-TR-81015
105 mm M68	ARLCB-TR-81037 ARLCB-TR-81041
105 mm M68 Gun Tube	ARLCB-TR-81017
155 MM M185	ARLCB-TR-81032
Otto Fuel II	ARLCB- TR-81026
Palladium-Copper Hydride	ARLCB-TR-81045
Penetrator	ARLCB-TR-81028
Photoelasticity	ARLCB-TR-81008
Plain-Strain Fracture Toughness	ARLCB-TR-81012
Plating	ARLCB-TR-81033 ARLCB-TR-81036
Posture Report	ARLCB-SP-81009
Preforms	ARLCB-TR-81029

SUBJECT	REPORT NUMBER
Press Forge	ARLCB-TR-81037
Pressure Effects	ARLCB-TR-81010
Pressure Loads	ARLCB-TR-81044
Pressure Quenched	ARLCB-TR-81020
Prestress	ARLCB-TR-81016
Primer	ARLCB-TR-81042
Process	ARLCB-TR-81033 ARLCB-TR-81036
Projectile Eccentricity	ARLCB-TR-81031
Projector Launch	ARLCB-TR-81007
Propelling Charge 155 mm M203	ARLCB-TR-81032
"Pump Thru"	ARLCB-TR-81033 ARLCB-TR-81036
Quadrilateral Isoparametric Element	ARLCB-TR-81027
Quench	ARLCB-TR-81023
Rational Approximations	ARLCB-TR-81022
Recoil Mechanism	ARLCB-TR-81006
Recursive Solutions	ARLCB-TR-81034 ARLCB-TR-81043
Regenerative Liquid Propellant Guns	ARLCB-TR-81026
Reinforcement	ARLCB-TR-81039
Residual Stress	ARLCB-TR-81005 ARLCB-TR-81019
Rifling Profile Plotting	ARLCB-TR-81017
Rotary Forge	ARLCB-TR-81029 ARLCB-TR-81037 ARLCB-TR-81041

SUBJECT	REPORT NUMBER
Sabot	ARLCB-TR-81028
Safe Service Life	ARLCB-TR-81032
Sensitivity Coefficients	ARLCB-TR-81002
Shrink-Fit Liners	ARLCB-TR-81011 ARLCB-TR-81046
Silicon Carbide Filament	ARLCB-TR-81003
Simulation	ARLCB-TR-81007
Spline Function	ARLCB-TR-81034 ARLCB-TR-81043
Split Ring	ARLCB-TR-81016
Spray Quench	ARLCB-TR-81023
Stainless Steel	ARLCB-TR-81035
Straightening	ARLCB-MR-81021 ARLCB-TR-81024
Strains	ARLCB-MR-81021 ARLCB-TR-81025
Stress	ARLCB-TR-81028
Stress Concentrations	ARLCB-TR-81008
Stress Intensity	ARLCB-TR-81005
Stress Intensity Factors	ARLCB-TR-81027
Stress Redistribution	ARLCB-TR-81005
Stress-to-Rupture	ARLCB-TR-81003
Superalloys	ARLCB-TR-81035
Superconductivity	ARLCB-TR-81020 ARLCB-TR-81045
Surface Diffusion	ARLCB-TR-81001

SUBJECT	REPORT NUMBER
Surface Heating	ARLCB-TR-81001
Tantalum Coatings	ARLCB-TR-81011
Target Hitting	ARLCB-TR-81002
Technical Publications	ARLCB-SP-81030
Telescoped Round	ARLCB-TR-81013
Temperature Effects	ARLCB-TR-81010
Temperature Gradient	ARLCB-TR-81038
Tensile Tests	ARLCB-TR-81007
Thermal Loads	ARLCB-TR-81044
Thermo-Elastic-Plastic Response	ARLCB-TR-81044
Thick-Wall Cylinder	ARLCB-TR-81027
Thick-Walled Tube	ARLCB-TR-81038
Time Measurement	ARLCB-MR-81014
Tube	ARLCB-TR-81032
Tungsten Coating	ARLCB-TR-81003
Tungsten Wires	ARLCB-TR-81039
20 mm M24A1 Gun	ARLCB-TR-81011 ARLCB-TR-81046
Ultrasonics	ARLCB-MR-81014 ARLCB-TR-81015
Variational Principle	ARLCB-TR-81034 ARLCB-TR-81043
Weight Function	ARLCB-TR-81027
X-Ray Diffraction	ARLCB-TR-81010

AD NUMBERS--1981

REPORT NUMBER	AD NUMBER
ARLCB-TR-81001	A095345
ARLCB-TR-81002	A096196
ARLCB-TR-81003	A096222
ARLCB-SP-81004	
ARLCB-TR-81005	A096193
ARLCB-TR-81006	A096877
ARLCB-TR-81007	B056223L
ARLCB-TR-81008	A099396
ARLCB-SP-81009	
ARLCB-TR-81010	A099112
ARLCB-TR-81011	B058199L
ARLCB-TR-81012	A099736
ARLCB-TR-81013	B058434L
ARLCB-MR-81014	A102056
ARLCB-TR-81015	B058435L
ARLCB-TR-81016	A101358
ARLCB-TR-81017	A101900
ARLCB-TR-81018	A101408
ARLCB-TR-81019	A101901
ARLCB-TR-81020	A101265
ARLCB-MR-81021	A101219
ARLCB-TR-81022	A101268
ARLCB-TR-81023	B059207L
ARLCB-TR-81024	A102792

AD NUMBERS--1981 (CONT.)

REPORT NUMBER	AD NUMBER
ARLCB-TR-81025	A101722
ARLCB-TR-81026	B058745L
ARLCB-TR-81027	A103208
ARLCB-TR-81028	A103475
ARLCB-TR-81029	A103386
ARLCB-SP-81030	A103774
ARLCB-TR-81031	A103387
ARLCB-TR-81032	B059758L
ARLCB-TR-81033	B061949L
ARLCB-TR-81034	A104184
ARLCB-TR-81035	A104313
ARLCB-TR-81036	B060283L
ARLCB-TR-81037	B060489L
ARLCB-TR-81038	A105243
ARLCB-TR-81039	B060490L
ARLCB-TR-81040	A105228
ARLCB-TR-81041	B061378L
ARLCB-TR-81042	B061132L
ARLCB-TR-81043	A109482
ARLCB-TR-81044	A109320
ARLCB-TR-81045	A110133
ARLCB-TR-81046	B062871I

SECURITY CLASSIFICATION OF THIS PAGE (When D to Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
. REPORT NUMBER	2. GOVT ACCESSION NO.	
ARLCB-TR-81001		
. TITLE (and Subtitio) THE MICROSTRUCTURAL AND PROPERTY O TREATED ELECTRODEPOSITS	CHANGES OF LASER	S. TYPE OF REPORT & PERIOD COVERED
		6. PERFORMING ORG. REPORT NUMBER
V. P. Greco		8. CONTRACT OR GRANT NUMBER(*)
PERFORMING ORGANIZATION NAME AND ADDRES Benet Weapons Laboratory	S	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
Watervliet Arsenal, Watervliet, NY DRDAR-LCB-TL	12189	AMCMS No. 32970672130 PRON No. 1A924411A1A
1. CONTROLLING OFFICE NAME AND ADDRESS		12. REPORT DATE
US Army Armament Research & Develo	-	January 1981
Large Caliber Weapon Systems Labor	atory	13. NUMBER OF PAGES
Dover, NJ 07801		24
4. MONITORING AGENCY NAME & ADDRESS(It differen	ent from Controlling Office)	15. SECURITY CLASS. (of this report)
		UNCLASSIFIED
	,	150. DECLASSIFICATION/DOWNGRADING

16. DISTRIBUTION STATEMENT (of thie Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the obstrect entered in Blook 20, if different from Report)

18. SUPPLEMENTARY NOTES

Presented at the 67th Annual AES Conference $\mbox{\tt G}$ Exhibit of Industrial Finishing, Milwaukee, WI, 22-26 June 1980.

19. KEY WORDS (Continue on reveree eide if necessary and identify by block number)

Electrodeposits

LASER

Surface Heating

Chromium

Surface Diffusion

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The use of the LASER as a tool to improve the properties of electrodeposits for wear and erosion resistance is introduced. The microstructures and microhardness of LASER treated electrodeposits of chromium (Cr) and duplex coatings of chromium over cobalt (Co) onto steel are shown. Cobalt as an underlay is shown to produce superior structures compared to chromium directly on steel which suffers from the formation of brittle phases at the chromium-steel interface.

÷.		
		£.
	×.	

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
ARLCB-TR-81002		
4. TITLE (and Subtitio) COMPUTATION SCHEMES FOR SENSITIVITY OF EXTERIOR BALLISTICS WITH VELOCIT		5. TYPE OF REPORT & PERIOD COVERED
DAMPING		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(*) C. N. Shen and Julian J. Wu		8. CONTRACT OR GRANT NUMBER(#)
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
Benet Weapons Laboratory		AMCMS No. 36KA7000204
Watervliet Arsenal, Watervliet, NY	12189	DA Project No. 1564018136GRN
DRDAR-LCB-TL		PRON No. 1A0215641A1A
11. CONTROLLING OFFICE NAME AND ADDRESS		12. REPORT DATE
US Army Armament Research & Develop	ment Command	January 1981
Large Caliber Weapon Systems Labora	tory	13. NUMBER OF PAGES
Dover, NJ 07801		36
14. MONITORING AGENCY NAME & ADDRESS(If different	t from Controlling Office)	15. SECURITY CLASS. (of this report)
		UNCLASSIFIED
		15. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of thie Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abetraci entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Presented at the 1980 Army Numerical Analysis and Computer Conference, NASA Ames Research Center, Moffett Field, California, 20-21 February 1980.

19. KEY WORDS (Continue on reverse elds if necessary and identify by block number)

Ballistics with Drag Sensitivity Coefficients Computational Scheme Iteration Procedure

Target Hitting

Initial Velocity and Elevation Angle Correction

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The principal equation of exterior ballistics with velocity square damping term has been integrated analytically in obtaining the solution for tangential velocity in terms of the elevation angle and other parameters. Using the variational method, four equations are obtained. The first one is derived from consideration of terrain slope and the second one is determined by hitting the target. The third and fourth equations are variations of the range and (CONT'D ON REVERSE)

DD 1 JAN 73 1473

EDITION OF 1 NOV 65 IS OBSOLETE 23

UNCLASSIFIED

20. Abstract (Cont'd)

elevation drag functions, respectively.

The computation involves integrals which can be evaluated analytically if the drag coefficient is relatively small. In simplifying the computational procedure we can assign the launch and impact slopes and then compute the drag functions and the terrain slope. However, this procedure is in reverse order because physically the terrain slope is known a priori the rounds are fired. If the terrain slopes and launch slopes are given first, an iteration procedure in computation is required to solve for the impact slopes. The sensitivity coefficients and the range ratios are then computed and plotted for various terrain slopes and launch slopes as the drag coefficients are varied.

REPORT DOCUMEN	READ INSTRUCTIONS BEFORE COMPLETING FORM	
. REPORT NUMBER	3. RECIPIENT'S CATALOG NUMBER	
ARLCB-TR-81003		
. TITLE (and Subtitie)		5. TYPE OF REPORT & PERIOD COVERED
REINFORCEMENT OF FeCTAlY WI (CARBON CORE) FILAMENT		
(CARBON CORL) FILAMENT	6. PERFORMING ORG. REPORT NUMBER	
· AUTHOR(•)	8. CONTRACT OR GRANT NUMBER(a)	
I. Ahmad, D. N. Hill, J. Ba R. Warenchak, and W. Heffer		
US Army Armament Research a	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS AMCMS No. 612105.H840011	
Benet Weapons Laboratory, D Watervliet, N.Y. 12189	DA Project No. 1L162105AM84 PRON No. AW-9-R0003-01-AW-M2	
1. CONTROLLING OFFICE NAME AND ADD	RESS	12. REPORT DATE
US Army Armament Research a	January 1981	
Large Caliber Weapon System Dover, New Jersey 07801	13. NUMBER OF PAGES	
4. MONITORING AGENCY NAME & AODRES	15. SECURITY CLASS. (of thie report)	
		UNCLASSIFIED
		15a. DECLASSIFICATION/DOWNGRAOING

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the ebetract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Published in Advanced Fibers and Composites for Elevated Temperatures edited by I. Ahmad and B. R. Noton, pp. 156-174; proceedings of symposium held at 108th AIME Annual Meeting, New Orleans, Louisiana, 20-21 February 1979.

19. KEY WORDS (Continue on reverse side if necessary and identity by block number)

Chemical Vapor Deposition
Diffusion Bonding
FeCrAlY Alloy
High Temperature Mechanical Properties

Metal Matrix Composites Silicon Carbide Filament Stress-to-Rupture

Tungsten Coating

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

In view of its high temperature stability (100 hr stress-to-rupture of 280 ksi at 2000°F), low density (0.115 lb.in.³) and high elastic modulus (60x10⁴ psi) silicon carbide filament (carbon core) is an attractive candidate as a reinforcement for high temperature matrix alloys. However, it reacts with most metals at elevated temperatures and must be protected with a suitable barrier coating. For FeCrAlY, tungsten was found to be a good barrier material. Therefore, 0.0005 in. thick coating of tungsten was (CONT'D ON REVERSE)

DD 1 JAN 73 1473

EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED

20. Abstract (Cont'd)

applied to the filament by a continuous chemical vapor deposition process. The coated filament had 100 hr $2000^{\circ}F$ rupture strength of 110-130 ksi. Composites of FeCrAlY containing about 30 v/o of the coated filament were fabricated using the diffusion bonding process and their tensile and stress-to-rupture properties were determined in the $1800^{\circ}F$ - $2000^{\circ}F$ range. While at room temperature the tensile strength of the composite was low, at elevated temperatures it approached values predicted by the rule of mixtures. At $1800^{\circ}F$, the 100 hr stress-to-rupture was 35 ksi. At higher temperatures, excessive coating-matrix interaction resulted in the degradation of the composite properties.

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION	READ INSTRUCTIONS BEFORE COMPLETING FORM					
1. REPORT NUMBER	2. GOVT ACCESSION NO.					
ARLCB-SP-81004						
4. TITLE (and Subtitle)	S. TYPE OF REPORT & PERIOD COVERED					
Computer User Guide for IBM 4341	,					
		6. PERFORMING ORG. REPORT NUMBER				
7. AUTHOR(a)		8. CONTRACT OR GRANT NUMBER(*)				
J. Pascale						
R. Romano		10 page well sugar page services				
9. PERFORMING ORGANIZATION NAME AND ADDRESS	lonmont Command	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS				
US Army Armament Research and Deve Benet Weapons Laboratory, DRDAR-LC		AMCMS No.				
Watervliet, N.Y. 12189	.D-112	DA Project.				
11. CONTROLLING OFFICE NAME AND ADDRESS		PRON NO.				
US Army Armament Research and Deve	lopment Command	15 January 1981				
Large Caliber Weapon System Labora		13. NUMBER OF PAGES				
Dover, New Jersey 07801	•	36				
14. MONITORING AGENCY NAME & ADDRESS(II ditteren	t from Controlling Office)	15. SECURITY CLASS. (of this report)				
		UNCLASSIFIED				
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE				
16. DISTRIBUTION STATEMENT (of this Report)						
A 1 C						
Approved for public release; dist	ea					
		•				
17. DISTRIBUTION STATEMENT (of the abstract entered	17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)					
		·				
18. SUPPLEMENTARY NOTES						
- 12						
19. KEY WORDS (Continue on reverse side if necessary and identify by block number)						
IBM 4341 Computer						
Central Processor						
20. ABSTRACT (Continue on reverse side if necessary and identify by block number)						
This guide provides an introduction to the IBM 4341 Computer, and associated operating system and describes in detail the facilities, services, procedures, and policies relating to its use.						

	CATION OF THIS PAGE(When Data Entered)	
*		
	14.5	

REPORT DOCUMENTATION	READ INSTRUCTIONS BEFORE COMPLETING FORM	
1. REPORT NUMBER ARLCB-TR-81005	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitio) RESIDUAL' STRESS REDISTRIBUTION CAUS AND CRACKS IN A PARTIALLY AUTOFRETT	S. TYPE OF REPORT & PERIOD COVERED	
7. AUTHOR(*) S. L. Pu and M. A. Hussain		PERFORMING ORG. REPORT NUMBER CONTRACT OR GRANT NUMBER(*)
Benet Weapons Laboratory Watervliet Arsenal, Watervliet, NY DRDAR-LCB-TL		10. PROGRAM ELEMENT PROJECT, TASK AREA & WORK UNIT NUMBERS AMCMS No. 611102H600011 DA Project No. 1L161102AH60 PRON No. 1A0215601A1A
U.S. Army Armament Research & Devel Large Caliber Weapon Systems Labora Dover, NJ 07801	•	12. REPORT DATE January 1981 13. NUMBER OF PAGES 21
14. MONÍTORING AGENCY NAME & ADDRESS(II differen	t from Controlling Office)	1S. SECURITY CLASS. (of this report) UNCLASSIFIED 15. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of thie Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the ebetrect entered in Block 20, If different from Report)

18. SUPPLEMENTARY NOTES

To be published in Journal of Pressure Vessel Technology.

19. KEY WORDS (Continue on reverse eide if necessary and identify by block number)

Stress Intensity

Residual Stress

Stress Redistribution

Autofrettaged Tube

Fracture Mechanics

20. ABSTRACT (Continue on reverse side if necessary and identity by block number)

A simple method is provided for the computation of the redistribution of residual stresses and the stress intensity factors due to the introduction of notches and cracks in a partially autofrettaged tube. Numerical results of several crack and notch problems are obtained by the method of thermal simulation. These results are shown to be in excellent agreement with those obtained from the classical method of superposition. The new method based on thermal simulation (CONT'D ON REVERSE)

SEC	URITY CLA	SSIFICATION	OF TH	IIS PAGE(Wh	en Data Enter	•d)					
20	. Abstr	act (Con	t'd)								
is	easier	to apply	and	it avoid	ds the s	ingular	stresses	near the	crack tip	when	t he
118	stribute	d crack	face	loading	is used	in the	method of	superpo	sition.		
										•	ļ
											ŀ
					٠						
	•										
	•										
											İ

REPORT DOCUMENTATION	READ INSTRUCTIONS BEFORE COMPLETING FORM			
I. REPORT NUMBER	2. GOVT ACCESSION NO.			
ARLCB-TR-81006				
4. TITLE (and Subtitie)		S. TYPE OF REPORT & PERIOD COVERED		
A CRITICAL REVIEW OF THE DRY FRICT COMPRESSIBLE FLUID RECOIL/COUNTER-	5. PERFORMING ORG. REPORT NUMBER			
7. AUTHOR(a)		8. CONTRACT OR GRANT NUMBER(#)		
H. J. Sneck				
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS		
US Army Armament Research and Deve		AMCMS No. 612603H181011		
Benet Weapons Laboratory, DRDAR-LO	CB-TL	DA Project No. TL162603AH18		
Watervliet, N.Y. 12189		PRON No. 1A1AZCO7NMLC		
11. CONTROLLING OFFICE NAME AND ADDRESS	larment Command	12. REPORT DATE February 1981		
US Army Armament Research and Deve Large Caliber Weapon Systems Labor		13. NUMBER OF PAGES		
Dover, New Jersey 07801	ratury	20		
14. MONITORING AGENCY NAME & ADDRESS(If differen	t from Controlling Office)	IS. SECURITY CLASS. (of this report)		
		UNCLASSIFIED		
		IS. DECLASSIFICATION/DOWNGRADING		
16. DISTRIBUTION STATEMENT (of this Report)				
is blanklagerian and real managery				
Approved for public release; distribution unlimited.				
		6		
17. DISTRIBUTION STATEMENT (of the ebetrect entered in Block 20, if different from Report)				
IS. SUPPLEMENTARY NOTES				
TO SUFFESHERICK! NOTES				
19. KEY WORDS (Continue on reveree elde if necessary at	nd identify by block number,			
Recoil Mechanism				
Dry-Friction Recoil System				
Compressible Fluid Recoil System				
		·		
20. ABSTRACT (Continue on reverse side if necessary an	d identify by block number)			
This report reviews two new recoil systems as possible replacements for the conventional mechanisms currently in use on medium and large size cannon. One uses compressible fluid to dissipate energy in viscous friction and store elastic energy for counter recoil. The other uses coulomb or dry friction for dissipation of the recoil energy.				
·		2		
	•			

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)	
s	
N)	
•1	
	941

REPORT DOCUMENTATION	PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
I. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
ARLCB-TR-81007		
SERVICE SIMULATION TEST SYSTEM FOR ENERGY PENETRATOR PROJECTILES	R KINETIC	5. TYPE OF REPORT & PERIOD COVERED
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(*) M. A. Scavullo and J. H. Underwoo	d	8. CONTRACT OR GRANT NUMBER(#)
PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
US Army Armament Research and Deve	lopment Command	AMCMS No. 41111629916
Benet Weapons Laboratory, DRDAR-LC	B-TL	
Watervliet, NY 12189		PRON No. 1A9289511A1A
11. CONTROLLING OFFICE NAME AND ADDRESS		12. REPORT DATE
US Army Armament Research and Deve	lopment Command	February 1981
Large Caliber Weapon Systems Labor	atory	13. NUMBER OF PAGES
Dover, NJ 07801		18
14. MONITORING AGENCY NAME & ADDRESS(If different	t from Controlling Office)	15. SECURITY CLASS. (of thie report)
		UNCLASSIFIED
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

Distribution limited to US Government Agencies only because of test and evaluation; February 1981. Other requests for this document must be referred to Commander, ARRADCOM, ATTN: Benet Weapons Laboratory, DRDAR-LCB-RA, Watervliet Arsenal, Watervliet, N. Y. 12189.

17. DISTRIBUTION STATEMENT (of the abetract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Presented at Second Charlottesville Conference on High Density Penetrator Materials, Foreign Science Technology Center, Charlottesville, Virginia, October 1980.

19. KEY WORDS (Continue on reverse elde if necessary and identify by block number)

Simulation

Projector Launch

Fracture

Tensile Tests

Failure

20. ABSTRACT (Continue on reverse side if necessary and identity by block number)

During the launch of a high density penetrator round the sabot pulls the penetrator through the gun tube with a given acceleration. This causes a tensile stress in the penetrator which is proportional to the mass of the unsupported rear end of the penetrator times the acceleration. This tensile stress is a maximum at the rear of the sabot near the location of the rearmost (CONT'D ON REVERSE)

20. Abstract (Cont'd)

groove which interconnects the sabot and penetrator. A simulation of this loading can be achieved by a tensile test in which the penetrator is loaded through its grooves. In this paper we will discuss the design of the tensile test apparatus and the preliminary results achieved. The test system can be used for comparisons of various designs, materials, coatings, and environmental effects.

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM	
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER	
ARLCB-TR-81008			
4. TITLE (and Substite) A PHOTOELASTIC STUDY OF STRESSES IN GROOVE CONNECTIONS OF THE SAME MATE	5. TYPE OF REPORT & PERIOD COVERED		
=:	-		
7. AUTHOR(•)		8. CONTRACT OR GRANT NUMBER(#)	
Y. F. Cheng			
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS	
US Army Armament Research and Devel Benet Weapons Laboratory, DRDAR-LCB		AMCMS No. 6111.01.91A0	
Watervliet, NY 12189)—IL	PRON No. 1A1281501A1A	
11. CONTROLLING OFFICE NAME AND ADDRESS	· · · · · · · · · · · · · · · · · · ·	12. REPORT DATE	
US Army Armament Research and Devel		February 1981	
Large Caliber Weapon Systems Labora Dover, NJ 07801	tory	13. NUMBER OF PAGES 30	
14. MONITORING AGENCY NAME & ADDRESS(If different	from Controlling Office)	15. SECURITY CLASS. (of thie report)	
		UNCLASSIFIED	
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE	
		SCHEDULE	
Approved for public release; distri			
17. DISTRIBUTION STATEMENT (of the ebetrect entered i	n Block 20, If different from	n Report)	
18. SUPPLEMENTARY NOTES			
19. KEY WORDS (Continue on reverse side if necessary and Groove Connections	i identify by block number)		
Photoelasticity			
Maximum Fillet Stresses			
Contact Stresses		***	
Stress Concentrations			
This report describes a three-dimen single-groove connections of the sainvestigated; namely, the British's Boundary stresses, interior stresse Shear-difference method was used and	sional photoelas me material. Tw tandard buttress s, and contact s	o groove profiles were and the new profile. tresses were determined.	

35

DD FORM 1473

20. Abstract (Cont'd)

Appropriate checks for the accuracy of the results were made. Heywood's empirical equation for calculating maximum fillet stress in loaded projections was reviewed. It was found that the British standard buttress is stronger than the new profile and that the Heywood's equation is not applicable in our problem. Further work on multi-groove connection is in progress.

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION	READ INSTRUCTIONS BEFORE COMPLETING FORM		
1. REPORT NUMBER		3. RECIPIENT'S CATALOG NUMBER	
ARLCB-SP-81009			
4. TITLE (and Subtitio)		S. TYPE OF REPORT & PERIOD COVERED	
POSTURE REPORT - FY 1980	2.0	Final	
POSTURE REPORT - FT 1980			
		1 Oct 79 thru 30 Sept 80 6. PERFORMING ORG. REPORT NUMBER	
7. AUTHOR(*)		8. CONTRACT OR GRANT NUMBER(#)	
Coordinated by: Plans and Resources Section			
Benet Weapons Laboratory			
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS	
US Army Armament Research and Deve	lopment Command	1200000	
Benet Weapons Laboratory, DRDAR-LC			
Watervliet, N.Y. 12189		DA Project. N/A PRON No. N/A	
11. CONTROLLING OFFICE NAME AND ADDRESS		12. REPORT DATE	
US Army Armament Research and Deve		March 1981	
Large Caliber Weapon Systems Labor	atory	13. NUMBER OF PAGES	
Dover, New Jersey 07801		75 1s. SECURITY CLASS. (of this report)	
14. MONITORING AGENCY NAME & ADDRESS(II differen	(Irom Controlling Office)		
		UNCLASSIFIED	
		15a, DECLASSIFICATION/DOWNGRADING	
		SCHEDULE	
Approved for public release; dist			
18. SUPPLEMENTARY NOTES			
19. KEY WORDS (Continue on reverse elde if necessary an	d identify by block number	1	
19. KEY WORDS (Continue on reverse elde it liecessary an	a reality by orota nemoci,	, 	
		j	
This report presents an overview of and programs in research technology support for cannon technology.	the most import	ant technical contributions	
·			
	•		
<u></u>			

9.80				
			1,750	

REPORT DOCUMENTATION	PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
ARLCB-TR-81010		
TITLE (and Subtitie)		S. TYPE OF REPORT & PERIOD COVERED
THERMAL AND STRUCTURAL ANALYSIS		
OF CHLORINE IMPURITIES ON PRESSUI	RIZED CADMIUM	Final
SULFIDE		5. PERFORMING ORG. REPORT NUMBER
AUTHOR(•)		8. CONTRACT OR GRANT NUMBER(e)
P. J. Cote, G. P. Capsimalis, and	d C. G. Homan	
PERFORMING ORGANIZATION NAME AND ADDRES		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
US Army Armament Research and Deve	•	AMCMS No. 611102H600011
Benet Weapons Laboratory, DRDAR-LO	CP-1T	DA Project No. 1L161102AH60
Watervliet, NY 12189		PRON No. 1A0215601A1A
1. CONTROLLING OFFICE NAME AND ADDRESS	.1	12. REPORT DATE
US Army Armament Research and Deve	•	March 1981
Large Caliber Weapon Systems Labor	ratory	13. NUMBER OF PAGES
Dover, NJ 07801		13
4. MONITORING AGENCY NAME & ADDRESS(If different	ent from Controlling Office)	15. SECURITY CLASS. (of this report)
		UNCLASSIFIED
		15a. DECLASSIFICATION/DOWNGRADING

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Submitted for publication to Applied Physics Letters.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Differential Scanning

Calorimetry X-Ray Diffraction Temperature Effects Cadmium Sulfide

Pressure Effects

20. ABSTRACT (Cantinus on reverse side if recessary and identify by block number)

Anomalous large diamagnetism ($\chi \sim 0.25/4\pi$ cgs units) and large positive magnetism ($\chi_{\rm V} \sim +10^{-4}$ cgs units) have recently been reported in pressure quenched CdS polycrystalline samples by Homan and MacCrone. These effects were shown to be sample material source dependent, and as a first step toward characterizing these samples, we compared the thermal and structural properties of various CdS samples before and after pressurization. (CONT'D ON REVERSE)

DD | FORM 1473

20. Abstract (Cont'd) containing up to 6 wt % Cl were prepared by precipitation from a chloride containing aqueous bath. We find that (i) Cl impurities are probably present in the form of a complex which can decompose on heating to CdS + CdCl₂, (ii) melting of a portion of the samples containing high levels of Cl occurs at 535°C and is attributed to the eutectic temperature of the CdS + CdCl₂ mixture, and (iii) heating beyond 535°C produces complete volatization of the CdCl₂ component. The results on samples prepared by mixing of CdS and CdCl₂·H₂O were examined and found to have similar thermal behavior. The cadmium sulfide used in the previous magnetization study was examined and, based on the similarities in the thermal and structural properties, we conclude that the samples which exhibit the anomalous magnetic effects were also prepared by precipitation. In agreement with earlier studies, metastable phases are observed after various pressurizations to above 4.0 GPa.

REPORT DOCUMENTA		READ INSTRUCTIONS BEFORE COMPLETING FORM
REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
ARLCB-TR-81011		
. TITLE (and Subtitle) STUDY OF EROSION RESISTANT MAP PART II: TANTALUM COATED LIN		5. TYPE OF REPORT & PERIOD COVERED
		6. PERFORMING ORG. REPORT NUMBER
R. L. Cullinan, G. D'Andrea,	and P. Croteau	8. CONTRACT OR GRANT NUMBER(*)
PERFORMING ORGANIZATION NAME AND	ADDRESS	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
US Army Armament Research and Benet Weapons Laboratory, DR Watervliet, NY 12189		AMCMS No. 64366280071212 DA Project No. 1W463628D00
1. CONTROLLING OFFICE NAME AND ADDR		12. REPORT DATE
US Army Armament Research an		April 1981
Large Caliber Weapon Systems	Laboratory	13. NUMBER OF PAGES
Dover, NJ 07801		50
4. MONITORING AGENCY NAME & ADDRESS	(if different from Controlling Office)	15. SECURITY CLASS. (of this report)
		UNCLASSIFIED
		15. DECLASSIFICATION/DOWNGRADING SCHEDULE

Distribution limited to US Government Agencies only because of test and evaluation; April 1981. Other requests for this document must be referred to Commander, ARRADCOM, ATTN: Benet Weapons Laboratory, DRDAR-LCB-RP, Watervliet Arsenal, Watervliet, N. Y. 12189.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse elds if necessary and identify by block number) Gun Tube Erosion

Shrink-fit Liners

Bore Plating

Tantalum Coatings 20 mm M24Al Gun Erosion Protection

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The major criteria for the condemnation of gun tubes is based on the excessive erosion of the bore which results in loss of range and accuracy. Gun tube erosion is caused by severe thermal, mechanical, and chemical factors interacting during the firing cycle. One approach to minimize erosion is to line gun barrels with wear resistant materials. This work introduces tantalum (CONT'D ON REVERSE)

20. Abstract (Cont'd)

coated steel liners to reduce excessive bore erosion. Firing tests conducted in the 20 mm M24Al gun system compare the Ta/steel with steel and chromium plated steel liners subjected to the same test conditions. Preliminary results indicate that the Ta/steel combination reduces erosion in the 20 mm gun system. Future work calls for adapting the Ta/steel liner concept to large caliber gun

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM		
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER		
ARLCB-TR-81012				
4. TITLE (and Subtitie)		5. TYPE OF REPORT & PERIOD COVERED		
THE CORRELATION OF FRACTURE TOUGH	JECC WITH	3. TYPE OF REPORT & PERIOD COVERED		
CHARPY V-NOTCH IMPACT TEST DATA	NESS WIIN			
CHART V-NOIGH IMPACT TEST DATA	6. PERFORMING ORG. REPORT NUMBER			
7. AUTHOR(*)		8. CONTRACT OR GRANT NUMBER(#)		
S. Tauscher				
,				
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS		
US Army Armament Research and Deve		AMCMS No. 3297.06.7588		
Benet Weapons Laboratory, DRDAR-LO	CB-TL	AMICHS NO. 3297.00.7588		
Watervliet, N.Y. 12189		PRON No. M1-7-P2913-M11A		
11. CONTROLLING OFFICE NAME AND ADDRESS		12. REPORT DATE		
US Army Armament Research and Deve		March 1981		
Large Caliber Weapon Systems Labor	ratory	13. NUMBER OF PAGES		
Dover, New Jersey 07801		72		
14. MONITORING AGENCY NAME & ADDRESS(II dilleren	t from Controlling Office)	15. SECURITY CLASS. (of this report)		
		_		
00		UNCLASSIFIED		
		154. DECLASSIFICATION/DOWNGRADING SCHEDULE		
16. DISTRIBUTION STATEMENT (of this Report)				
Approved for public release; dist:	ribution unlimite	ed .		
17. DISTRIBUTION STATEMENT (of the abetract entered	in Block 20, if different from	m Report)		
18. SUPPLEMENTARY NOTES				
10. SUPPLEMENTARY NOTES				
19. KEY WORDS (Continue on reverse side if necessary an	d identify by block number)			
Barsom-Rolfe Correlation	_ 120,111, 0, 0,000, 1,22,001,			
Charpy Impact Test				
Correlation				
Linear Regression				
Plain-Strain Fracture Toughness				
20. ABSTRACT (Continue on reverse side if necessary and	lidentify by block number)			
Fracture toughness data is compare	ed with the Charp	y V-notch impact data. The		
applicability of various regression	on models for sho	wing the relationship of		
K_{I_C} with other mechanical properti	les is examined f	or gun steel. The types of		
material were classified by steel	maker, type of f	orging, and location within		
the tube. It was concluded that,	of the models ex	camined, $K_{Lo}^2 = 5$ CVN $\sigma_{VS}25$		
σys², the Barsom-Rolfe correlation	, provided the b	est correlation of KI with		
mechanical property data. However	e, even then, the	prediction of KIc was only		
within 6 - 18 percent of the measu	red value.			

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)			
				1
				į
				1
				i
				i j
				i
				1
				i
5				
		8		1
				1
12				
W				
		B		
			2	
			8	
7				
31				
5				
e				- 1

REPORT DOCUMENTATION	PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER .	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
ARLCB-TR-81013		
4. TITLE (and Subtitle)		5. TYPE OF REPORT & PERIOD COVERED
WATEL ADVISORY CONCERNS TOR A NEAD	TEDM EUTIME WATE	
MAIN ARMAMENT CONCEPTS FOR A NEAR TERM FUTURE MAIN BATTLE TANK		
BAILLE IANK		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(e)		8. CONTRACT OR GRANT NUMBER(*)
John K. Jorczak		
9. PERFORMING ORGANIZATION NAME AND ADDRESS Benet Weapons Laboratory		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS AMCMS No. 612603.H1.80111
Watervliet Arsenal, Watervliet, N.	Y. 12189	DA Project No. 1L162603AH18
DRDAR-LCB-TL		PRON No. 1A-0-2ZB01-0-NMLC
11. CONTROLLING OFFICE NAME AND ADDRESS		12. REPORT DATE
US Army Armament Research and Deve		March 1981
Large Caliber Weapon Systems Labor	atory	13. NUMBER OF PAGES . 43
Dover, N.J. 07801 14. MONITORING AGENCY NAME & ADDRESS(it differen	t from Controlling Office)	IS. SECURITY CLASS. (of this report)
MONTO ACENT NAME - ACCUSATION		Services (or and repend
		UNCLASSIFIED
		15. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report)		
Distribution limited to US Governmevaluation; March 1981. Other reto Commander, ARRADCOM, ATTN: Benewatervliet Arsenal, Watervliet, N. 17. DISTRIBUTION STATEMENT (of the electroct entered)	quests for this t Weapons Labora Y. 12189.	document must be referred tory, DRDAR-LCB-DC,
IS. SUPPLEMENTARY NOTES		
10. SUFFERENTANT NOTES		
	did-wife to block overhead	
19. KEY WORDS (Continue on reverse side if necessary ar	id identity by block number)	
Integral Weapon Feeder		
Telescoped Round		·
20. ABSTRACT (Continue on reverse side if necessary on	d Identify by block numbers	
120- ABSTRACT (CONTINUE ON PETERS STEEL IT DECEMBERS ON	m by dioux number)	
This study was undertaken to devel envelope configurations for near t the XM-1 successor). Ammunition, siderations from a broad spectrum	erm future comba- weapon and vehic	t fighting vehicles (primarily le interface were main con-

81			#5
*			
			4
		ž.	
	12		
			E

REPORT DOCUMENTATION	READ INSTRUCTIONS BEFORE COMPLETING FORM		
. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER	
ARLCB-MR-81014			
I. TITLE (and Subtitle)		5. TYPE OF REPORT & PERIOD COVERED	
AN IN-PROCESS THICKNESS DETERMINAT	ION DURING		
ELECTROPLATING OR ELECTROPOLISHING	BY THE		
ULTRASONIC PULSE-ECHO TECHNIQUE		6. PERFORMING ORG. REPORT NUMBER	
7. AUTHOR(e)		8. CONTRACT OR GRANT NUMBER(*)	
J. Frankel			
W. J. Korman			
G. C. Capsimalis			
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS	
US Army Armament Research and Deve	-	AMCMS No. 611102H600011	
Benet Weapons Laboratory, DRDAR-LO	CB-TL	DA Project No. 1L161102AH60	
Watervliet, N.Y. 12189		PRON No. 1A0215601A1A	
11. CONTROLLING OFFICE NAME AND ADDRESS		12. REPORT DATE	
US Army Armament Research and Deve			
Large Caliber Weapon Systems Labor	ratory	13. NUMBER OF PAGES	
Dover, New Jersey 07801 14. MONITORING AGENCY NAME & ADDRESS(If different		15. SECURITY CLASS. (al this report)	
14. MONITORING AGENCY NAME & ADDRESS(II differen	t from Controlling Office)	15. SECURITY CLASS. (of this report)	
		UNCLASSIFIED	
		154. DECLASSIFICATION/DOWNGRADING	

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the ebstrect entered in Block 20, 1f dillerent from Report)

18. SUPPLEMENTARY NOTES

Published in 1980 Ultrasonics Symposium Proceedings, November 1980.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Electroplated Thickness

Electroplating

Electropolished Thickness

Time Measurement

Ultrasonics

20. ABSTRACT (Continue on reverse side if necessary and identity by block number)

The transit time change of an echo of an ultrasonic echo train is used to determine the thickness of electroplated chromium on a steel substrate and the change of thickness of the steel substrate during the electropolishing or surface removal operation.

SECUR	ITY CLASSIFIC	ATION OF THIS	PAGE(When Date	Entered)					
	S * 0								
ļ.									
								2	
ļ.									
10									
8									
		85							
			8		34				1
			¥)						
						121			
	10						9		.
				,					1

	REPORT DOCUMENTATION		READ INSTRUCTIONS BEFORE COMPLETING FORM
1.	REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
	ARLCB-TR-81015		
4.	TITLE (and Subtitie) COMPUTER CONTROLLED ULTRASONIC INCANNON TUBES	SPECTION OF	S. TYPE OF REPORT & PERIOD COVERED
			6. PERFORMING ORG. REPORT NUMBER
7.	Author(*) Mark Johnson		8. CONTRACT OR GRANT NUMBER(*)
9.	PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
	US Army Armament Research and Dev	elopment Command	AMCMS No. 53970M63500
	Benet Weapons Laboratory, DRDAR-L	CB-TL	
	Watervliet, NY 12189		PRON No. 1A925155GGGG
11	. CONTROLLING OFFICE NAME AND ADDRESS		12. REPORT DATE
	US Army Armament Research and Dev		April 1981
	Large Caliber Weapon Systems Labo	ratory	13. NUMBER OF PAGES
	Dover, NJ 07801		28
T	MONITORING AGENCY NAME & ADDRESS(If differen	it from Controlling Office)	15. SECURITY CLASS. (of this report)
			UNCLASSIFIED
			ISE. DECLASSIFICATION/DOWNGRADING SCHEDULE
16	. DISTRIBUTION STATEMENT (of this Report)		

Distribution limited to US Government Agencies only because of test and evaluation; April 1981. Other requests for this document must be referred to Commander, ARRADCOM, ATTN: Benet Weapons Laboratory, DRDAR-LCB-RC, Watervliet Arsenal, Watervliet, N. Y. 12189.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Ultrasonics

Minicomputer

Nondestructive Testing

Fatigue Cracks

Cannon

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

An automated system for ultrasonically inspecting cannon tubes during fatigue testing has been developed. The tubes are inspected for cracks growing inward from the outer surface toward the tube center, measuring the depth, length, and angular position of each crack detected. The system uses a minicomputer to control the test equipment and process the results. The computer is (CONT'D ON REVERSE)

49

REPORT DOCUMENTATION	PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
ARLCB-TR-81016		
. TITLE (and Subtitle)		S. TYPE OF REPORT & PERIOD COVERED
BASIC MECHANICS OF DE BANGE OBTUR RING PRESTRESSING	ATOR SPLIT	
		6. PERFORMING ORG. REPORT NUMBER
· AUTHOR(s)		8. CONTRACT OR GRANT NUMBER(e)
D. F. Finlayson		
PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
Benet Weapons Laboratory, ARRADCOM		AMCMS No. 738017.C30Q70191C0
Watervliet Arsenal, Watervliet, N DRDAR-LCB-TL	Y 12189	PRON No. M179Q761M11A
. CONTROLLING OFFICE NAME AND ADDRESS		12. REPORT DATE
US Army Armament Research & Devel		April 1981
Large Caliber Weapon Systems Labo	ratory	13. NUMBER OF PAGES
Dover, NJ 07801		23
4. MONITORING AGENCY NAME & ADDRESS(II differen	nt from Controlling Office)	15. SECURITY CLASS. (of this report)
		UNCLASSIFIED
		15. DECLASSIFICATION/DOWNGRADING

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the ebstrect entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

De Bange Obturator

Split Ring

Prestress

Elastic-Plastic Deformation

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

An analysis is presented to show the relationship between the maximum obtainable residual shear force in a split ring preform and the prestressing parameters (included angle between fixture grips and total angle of twist). Also included is an analysis of the section depth of the ring that is required to provide sufficient material for the finish machining operation. Application of the formulas derived would require the quantification of certain parameters by either experimental or numerical methods.

280				
				14
			2	
	-			
			925	

REPORT DOCUMENTATION	READ INSTRUCTIONS BEFORE COMPLETING FORM					
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER				
ARLCB-TR-81017						
4. TITLE (and Subtitle)		S. TYPE OF REPORT & PERIOD COVERED				
EVALUATION OF MODIFIED BORE EROSION	GAGE					
	5. PERFORMING ORG. REPORT NUMBER					
		o. Penronmino ono. Nel on Nomber				
7. AUTHOR(*)		8. CONTRACT OR GRANT NUMBER(*)				
G. Capsimalis, R. Williams, and G.	D'Andrea					
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS				
US Army Armament Research & Develop	ment Command	AMCMS No. 53970M63500				
Benet Weapons Laboratory, DRDAR-LCB	-TL	PRON No. 1A9241561A1A				
Watervliet, NY 12189						
11. CONTROLLING OFFICE NAME AND ADDRESS	want Command	12. REPORT DATE				
US Army Armament Research & Develop Large Caliber Weapon Systems Labora		May 1981				
Dover, NJ 07801	LOLY	25				
14. MONITORING AGENCY NAME & ADDRESS(If differen	t from Controlling Office)	1S. SECURITY CLASS. (of this report)				
		UNCLASSIFIED				
		154. DECLASSIFICATION/DOWNGRADING				
16. DISTRIBUTION STATEMENT (of this Report)						
Approved for public release; distri	bution unlimited	l.				
17. DISTRIBUTION STATEMENT (of the ebetrect entered	In Black 20 if different fro	om Report)				
17. DISTRIBUTION STATEMENT (of the ebetract attared	In Block 20, it will the					
		*				
18. SUPPLEMENTARY NOTES						
19. KEY WORDS (Continue on reverse elde if necessary a	nd identify by block number)				
Bore Erosion Gage						
Rifling Profile Plotting						
105 mm M68 Gun Tube						
20. ABSTRACT (Continue on reverse side if necessary and identify by block number)						
A bore erosion gage developed earlier (Krupski and Audino, WVT QA-7701 (1977))						
for monitoring the coating thickness	ss and erosion of	the 105 mm M68 in the				
region up to 40 inches from the ori						
problem of the lack of responsibility						
circumference has been successfully analysis of the results have demonst		est data and statistical				
analysis of the results have demons	strated that the	(CONT'D ON REVERSE)				
1		(Jour D ou Maranou)				

٥.	ABSTRACT										
ca t:	relative istical a	change ccuracy	in the can be	bore rad further	lius with improve	an accu d by inc	racy of reasing	± 0.	005 ind number	ch. of	The data
int	is.										
										1.5	
							10.75				
											120

REPORT DOCUMENTATION F	PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
ARLCB-TR-81018		
4. TITLE (and Subtitie) FATIGUE AND FRACTURE TESTS OF GAS BO	TTLE MATERIAL	5. TYPE OF REPORT & PERIOD COVERED
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(e)		8. CONTRACT OR GRANT NUMBER(*)
J. H. Underwood and J. J. Zalinka		
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
US Army Armament Research and Develo	=	AMCMS No. 691000H180021
Benet Weapons Laboratory, DRDAR-LCB- Watervliet, NY 12189	·TL	PRON No. 1A0271951A1A
11. CONTROLLING OFFICE NAME AND ADDRESS		12. REPORT DATE
US Army Armament Research and Develo		May 1981
Large Caliber Weapon Systems Laborat	ory	13. NUMBER OF PAGES
Dover, NJ 07801		24
14. MONITORING AGENCY NAME & ADDRESS(II different	from Controlling Office)	15. SECURITY CLASS. (of thie report)
NASA Langley Research Center		UNCLASSIFIED
Research Facilities Engineering Divi Hampton, VA 23665	lsion	15. DECLASSIFICATION/DOWNGRADING SCHEDULE

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the ebetrect entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Prepared by Benet Weapons Laboratory, US Army ARRADCOM, under contract to NASA Langley Research Center.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Fracture

Fatigue

Fatigue Life

Cylinder

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

A program of nondestructive inspection, mechanical tests, and fracture mechanics tests was performed on a high pressure air storage bottle. The tests were planned to provide the basis of fracture mechanics life analysis of gas bottles in their service environment. This report describes the procedures and results and gives a preliminary analysis of the results.

SECURITY CLASSIFICATION	OF THIS PAGE(Whe	n Data Entered)	 and the second second second	
	7/2			
1				
1				
1				
1				
1				
				16
				80
1				
I .				
				1
l .				
ľ				1
1				
1				
			*7	
1				-
1				
1				
l				
l				
l				
l				
l			**	
l				
l				
l	D)			
l				
l				
				1
l				
l			9	1
				1
				1
11				1
I				1
				1
				1
. 11				
*			19	× 1
				1
				1

REPORT DOCUMENTATION F	PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
T. REPORT NUMBER ARLCB-TR-81019	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitie) NUMERICAL PREDICTION OF RESIDUAL STR AUTOFRETTAGED TUBE OF COMPRESSIBLE M	5. TYPE OF REPORT & PERIOD COVERED 6. PERFORMING ORG. REPORT NUMBER	
P. C. T. Chen		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS U.S. Army Armament Research & Develo Benet Weapons Laboratory, DRDAR-LCB- Watervliet, NY 12189	-	10. PROGRAM ELEMENT PROJECT, TASK AREA & WORK UNIT NUMBERS AMCMS No. 6111.01.91A0.0 DA Project No. 1T161101A91A PRON No. 1A1281501A1A
11. CONTROLLING OFFICE NAME AND ADDRESS U.S. Army Armament Research & Develo Large Caliber Weapon Systems Laborat Dover, NJ 07801	-	May 1981 13. NUMBER OF PAGES 16
14. MONITORING AGENCY NAME & ADDRESS(If different	from Controlling Office)	15. SECURITY CLASS. (of this report) UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the ebeiract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Presented at 1981 Army Numerical Analysis and Computer Conference, Huntsville, Alabama, 26-27 February 1981. Published in proceedings of the conference.

19. KEY WORDS (Continue on reverse elde if necessary and identify by block number)

Elastic-Plastic Deformation

Residual Stress

Autofrettaged Tube

Finite-Difference Method

20. ABSTRACT (Continue on reverse side if recorsely and identity by block number)
The residual stresses in an autofrettaged tube of compressible material are obtained by a new finite-difference approach. The tube is assumed to obey the von Mises' yield criterion, the Prandtl-Reuss flow theory and the isotropichardening rule. In order to test the accuracy of the computer program, a convergence study for a nearly incompressible tube has been made and compared with the exact solution as well as the simulated results for residual stresses in an incompressible tube.

SECORITY CLASSIFICATION OF THIS PAGE (When	Det Batered)
320	
3.00	
	V 1
	*
). N#0	* 1
	- 1
	2
	2 *
	,
	1
	₩
	1
II is a	
	e.
	· ·
D67	2

REPORT DOCUMENTATION	PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
REPORT NUMBER	2. GOVT ACCESSION N	O. 3. RECIPIENT'S CATALOG NUMBER
ARLCB-TR-81020		
. TITLE (and Subtitle)		5. TYPE OF REPORT & PERIOD COVERED
SUPERCONDUCTIVITY IN PRESSURE QUENC	HED	
CADMIUM SULFIDE AT 77 K		
		6. PERFORMING ORG. REPORT NUMBER
· AUTHOR(a)		8. CONTRACT OR GRANT NUMBER(*)
C. G. Homan (BWL), K. Laojindapun (RPI), and	
R. K. MacCrone (RPI).		
PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
U.S. Army Armament Research & Devel	*	AMCMS No. 611102H600011
Benet Weapons Laboratory, DRDAR-LCB	-TL	PRON No. 1A1283121A1A
Watervliet, NY 12189		12. REPORT DATE
		May 1981
U.S. Army Armament Research & Devel Large Caliber Weapon Systems Labora	•	13. NUMBER OF PAGES
Dover, NJ 07801	LOLY	15
4. MONITORING AGENCY NAME & ADDRESS(If differen	t from Controlling Office	15. SECURITY CLASS. (of this report)
		UNCLASSIFIED
		15e. DECLASSIFICATION/DOWNGRADING

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the electract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

To be presented at XVI International Conference on Low Temperature Physics, 19-25 August 1981, Los Angeles, CA. To be published in Journal of Physical Review Letters.

19. KEY WORDS (Continue on reverse eide if necessary and identity by block number)

Cadmium Sulfide

Diamagnetism

Pressure Quenched

Superconductivity

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Observations of magnetic field induced collapse of Meissner sized diamagnetism with a coincident decrease in electrical conductivity in pressure quenched CdS material at 77 K are reported. These results are consistent with the existence of superconducting regions in the specimens at this temperature.

SECURITY	CLASSIF	CATION OF THIS P.	AGE(When Data Entered)			
	•					
	19					
						- 1
1						
1 5						
						2 0
						1
				9)		
	27					
						1
						1
						1
						-
						1
						1
						1
						1
						1
						- 1
						-
						- 1
			72			
						1

REPORT DOCUMENTATION	READ INSTRUCTIONS BEFORE COMPLETING FORM	
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
ARLCB-MR-81021		
4. TITLE (end Subtitie)		5. TYPE OF REPORT & PERIOD COVERED
A FOUR POINT BENDING EXPERIMENT	:	:
		6. PERFORMING ORG. REPORT NUMBER
		or the same of the
7. AUTHOR(*)		8. CONTRACT OR GRANT NUMBER(a)
R. V. Milligan and V. J. Olmstead		
9. PERFORMING ORGANIZATION NAME AND ADDRESS	·	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
U.S. Army Armament Research & Devel	-	AMCMS No. 32111600116
Benet Weapons Laboratory, DRDAR-LCB	-TL	PRON No. T196935802NMAE
Watervliet, NY 12189		12. REPORT DATE
U.S. Army Armament Research & Devel	opment Command	June 1981
Large Caliber Weapon Systems Labora	-	13. NUMBER OF PAGES
Dover, NJ 07801	A form Controlling Office)	21 15. SECURITY CLASS. (of this report)
14. MONITORING AGENCY NAME & ADDRESS IT MITTER	i from Controlling Office)	
		UNCLASSIFIED
		154. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report)		
TO SISTINGS TON STATEMENT (OF SITE ASSESS)		
Approved for public release; distri	bution unlimited	
Approved for public felease, distri	.Ducton unitmiced	
17. DISTRIBUTION STATEMENT (of the abetract entered	in Block 20, if different fro	om Report)
		·
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse elds if necessary as	nd identify by block number)
Straightening		
Deflections Strains		
Gun Tubes	•	
20. ABSTRACT (Continue on reverse side if necessary an		
This report presents data obtained M68 rotary forged gun tube. The fo		
standard hydraulic straightening pr		
designed and fabricated by the Bene		
Branch. Strains were measured at s	everal points on	the surface in a circum-
ferential plane using standard foil	. type resistance	gages and standard strain (CONT"D ON REVERSE)

20. ABSTRACT (CONT'D)

readout equipment. Deflections at mid-span were measured with a rotary ten turn potentiometer. Load strain and load deflection curves are presented and compared with theory. The agreement is quite good. The difference between theory and experiment probably can be attributed to the larger diameter of the tube nearer the breech end which could contribute to greater stiffness. Maximum strains were less than 1.4 percent and are quite low compared to those expected in three point bending. The experiment shows a good possibility of using four point bending to eliminate the need for hot straightening.

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
ARLCB-TR-81022		
4. TITLE (end Subtitie) A RATIONAL FUNCTION APPROXIMATION FOR THE INTEGRATION POINT IN EXPONENTIALLY WEIGHTED FINITE ELEMENT METHODS		5. TYPE OF REPORT & PERIOD COVERED 6. PERFORMING ORG. REPORT NUMBER
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(a)		8. CONTRACT OR GRANT NUMBER(a)
Joseph E. Flaherty		Grant No. AFOSR 80-0192.
9. PERFORMING ORGANIZATION NAME AND ADDRESS US Army Armament Research & Development Command Benet Weapons Laboratory, DRDAR-LCB-TL Watervliet, NY 12189		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS AMCMS No. 611102H5710011 DA Project No. 1L161102BH57 PRON No. 1A1235821A1A
US Army Armament Research & Development Command Large Caliber Weapon Systems Laboratory Dover, NJ 07801		12. REPORT DATE
		June 1981 13. NUMBER OF PAGES 18
14. MONITORING AGENCY NAME & ADDRESS(It differen	t from Controlling Office)	UNCLASSIFIED 15. DECLASSIFICATION/DOWNGRADING SCHEDULE

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

To be published in the International Journal for Numerical Methods in Engineering. This research was partially sponsored by the U.S. Air Force Office of Scientific Research, Air Force Systems Command, U.S.A.F. The U.S. (CONT'D ON REVERSE)

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Convection-Diffusion Problems Exponential-Weights Finite Element Method Rational Approximations

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

A rational function is presented for approximating the function f(z) = cothz - 1/z that appears in several exponentially fitted or weighted finite difference and finite element methods for convection-diffusion problems. approximation is less expensive to evaluate than f(z) and provides greater accuracy than the doubly asymptotic approximation when z = 0(1).

DD 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE 63

UNCLASSIFIED

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
. REPORT NUMBER 2.	OVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
ARLCB-TR-81023		
. TITLE (end Subtitie)		S. TYPE OF REPORT & PERIOD COVERED
THE EFFECT OF PREBORE QUENCH TIME ON AND UNIFORMITY OF HARDENING IN 105mm		*
GUN TUBE FORGING	1100	6. PERFORMING ORG. REPORT NUMBER
. AUTHOR(*)		8. CONTRACT OR GRANT NUMBER(.)
J. Passmore D. G. Baldrey		
9. PERFORMING ORGANIZATION NAME AND ADDRESS US Army Armament Research and Development Command Benet Weapons Laboratory, DRDAR-LCB-TL		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
		AMCMS No. 3297.06.7588
Watervliet, N.Y. 12189		PRON M1-7-P2913-(01)-M1-1A
11. CONTROLLING OFFICE NAME AND ADDRESS		12. REPORT DATE
US Army Armament Research and Development Command		July 1981
Large Caliber Weapon Systems Labora Dover, New Jersey 07801	ory	13. NUMBER OF PAGES 45
4. MONITORING AGENCY NAME & ADDRESS(If different	om Controlling Office)	15. SECURITY CLASS. (of thie report)
		UNCLASSIFIED
		15. DECLASSIFICATION/DOWNGRADING

Distribution limited to US Government Agencies only because of proprietary information; July 1981. Other requests for this document must be referred to Commander, ARRADCOM, ATTN: Benet Weapons Laboratory, DRDAR-LCB-S, Watervliet Arsenal, Watervliet, N. Y. 12189.

17. DISTRIBUTION STATEMENT (of the abstract antered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Quench Spray Quench Bore Quench Hardenability 8620 Steel

Hollow Tube Forging

High Strength Steel

20. ABSTRACT (Continue on reverse eide if necessary and identify by block number)

At Watervliet Arsenal, the quenching of hollow steel gun tube forgings from the austenitizing temperature has commonly involved a combination of bore quenching (I.D.) and spray quenching (O.D.). The bore quench is generally initiated prior to the start of the O.D. spray quench. This is called a prebore quench. This work evaluated the effect of quench time on the depth and uniformity of hardening in 105mm M68 gun tube forgings. (The prebore quench times were varied from 0 to 150 sec. in this investigation.)

(CONT'D ON REVERSE)

DD 1 JAN 73 1473

EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED

20. ABSTRACT (Cont'd)

Cooling rates in the tube wall for various prebore quench times were determined by welding sections of AISI 8620 steel to the breech and muzzle ends of the tube. The hardness gradient through the tube wall was used to determine cooling rates at 1300°F from the known relationships between end-quench hardenability curves and Jominy test bar cooling rates. The minimum cooling rates, at 1300°F, varied from 4°F/sec. to 10°F/sec. at the muzzle end of the tube. The point of minimum hardness (slowest cooling rate) moved toward the 0.D. of the tube as the prebore quench time increased.

The minimum cooling rates resulting from the prebore quench times used in this experiment are sufficient to exceed the critical cooling rate for gun steel. As a result, the prebore quench time in the range of 0-150 seconds has no effect on the depth of uniformity of hardening in 105mm M68 gun tube forgings.

REPORT DOCUMENTATION PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM		
	3. RECIPIENT'S CATALOG NUMBER		
ARLCB-TR-81024			
4. TITLE (and Subtitle)	5. TYPE OF REPORT & PERIOD COVERED		
A COMPARISON OF THREE POINT AND FOUR POINT			
LOADING IN ELASTIC-PLASTIC BENDING OF BEAMS	Final		
	6. PERFORMING ORG. REPORT NUMBER		
7. AUTHOR(*)	8. CONTRACT OR GRANT NUMBER(#)		
R. Vincent Milligan			
	The second secon		
9. PERFORMING ORGANIZATION NAME AND ADDRESS US Army Armament Research & Development Command	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS		
Benet Weapons Laboratory, DRDAR-LCB-TL	AMCMS No. 612105H840011		
Watervliet, NY 12189	DA Project No. 1L162105AH84		
11. CONTROLLING OFFICE NAME AND ADDRESS	PRON NO. 1A0217131A1A		
US Army Armament Research & Development Command	June 1981		
Large Caliber Weapon Systems Laboratory	13. NUMBER OF PAGES		
Dover, NJ 07801	22		
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)	15. SECURITY CLASS. (of this report)		
	UNCLASSIFIED		
31	15. DECLASSIFICATION/DOWNGRADING SCHEDULE		
16. DISTRIBUTION STATEMENT (of this Report)			
Approved for public release; distribution unlimit	ed.		
17. DISTRIBUTION STATEMENT (of the ebetrect entered in Block 20, if different from	om Report)		
18. SUPPLEMENTARY NOTES			
2			
19. KEY WORDS (Continue on reverse side if necessary and identify by block number)			
Beams			
Straightening			
Bending			
Elastic-Plastic Analysis			
20. ABSTRACT (Continue on reverse side if necessary and identify by block number)			
A comparison between the maximum deflections resulting from beams symmetrically			
loaded into the elastic-plastic region is presented for the case of three and			
four point bending. The results indicate that significantly larger deflections			
can be obtained for the case of four point bending while keeping the maximum			
fiber strains approximately the same. It appears that using the four point			
bending approach holds certain advantages in straightening operations for the			
	(CONT'D ON REVERSE)		
·			

20. ABSTRACT (CONT'D)	
removal of permanent deflections with the post straightening in some instances. The concept deformation is put forth as a possible explana method over the other.	t of distribution of placeto
>	
·	
	· ·
	2

SECURITY CLASSIFICATION OF THIS PAGE(When Date Entered)

REPORT DOCUMENTATION	N PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
ARLCB-TR-81025		
TITLE (and Subtitio) MOMENT-STRAIN RELATIONSHIPS IN ELASTIC-PLASTIC BENDING OF BEAMS		5. TYPE OF REPORT & PERIOD COVERED
		6. PERFORMING ORG. REPORT NUMBER
AUTHOR(*)		8. CONTRACT OR GRANT NUMBER(a)
R. V. Milligan		
PERFORMING ORGANIZATION NAME AND ADDREST		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
U.S. Army Armament Research & De Benet Weapons Laboratory, DRDAR-	Velopment Command	AMCMS No. 612105H840011
Watervliet, NY 12189		DA Project No. 1L162105AH84 PRON No. 1A0217131A1A
CONTROLLING OFFICE NAME AND ADDRESS	1	12. REPORT OATE
US Army Armament Research & Deve Large Caliber Weapon Systems Lab		June 1981
Dover, NJ 07801	oracory	13. NUMBER OF PAGES 23
4. MONITORING AGENCY NAME & ADDRESS(If diffe	erent from Controlling Office)	1S. SECURITY CLASS. (of thie report)
		UNCLASSIFIED
		15a. DECLASSIFICATION/DOWNGRADING
	tribution unlimited	15. DECLASSIFICATION/DOWNGRADING SCHEOULE
Approved for public release; dis		d.
Approved for public release; dis		d.
Approved for public release; dis		d.
Approved for public release; dis 7. DISTRIBUTION STATEMENT (of the abetract enter 8. SUPPLEMENTARY NOTES	red in Block 20, if different fro	d. m Report)
Approved for public release; dis DISTRIBUTION STATEMENT (of the abetract enter Supplementary notes Rey words (Continue on reverse elde if necessar) Sending Strain	red in Block 20, if different fro	d. m Report)
Approved for public release; dis Distribution Statement (of the ebetract enter Supplementary notes Rey words (Continue on reverse elde if necessar) Bending Strain Elastic-Plastic Deformation	red in Block 20, if different fro	d. m Report)
Approved for public release; dis 7. DISTRIBUTION STATEMENT (of the ebetract enter 8. SUPPLEMENTARY NOTES 8. ABSTRACT (Continue on reverse side if necessary Theoretical expressions for bending	red in Block 20, if different from y and identify by block number) and identify by block number) ing moment versus d	d. m Report) epth of elastic-plastic
Approved for public release; dis 7. DISTRIBUTION STATEMENT (of the ebetract enter 8. SUPPLEMENTARY NOTES 9. SUPPLEMENTARY N	and identify by block number) ing moment versus d cubular, and solid or strain as a func	epth of elastic-plastic circular beams are develtion of geometry and depth

20. Abstract (Cont'd) plane" is examined. Ex The basis for determini calculation are given. is presented.	perimental ng residual	data is prese l or permanent	strains an	d expres	sions fo	or their
	The Month					a =
			•			
						•
						: :
>						g d To
9						
					000	9
\$2						
140						
-						
n 5						
94					77.	

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM			
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER			
ARLCB-TR-81026					
4. TITLE (end Subtitie)		5. TYPE OF REPORT & PERIOD COVERED			
REGENERATIVE LIQUID PROPELLANT GUN	TECHNOLOGY	2 1			
		6. PERFORMING ORG. REPORT NUMBER			
7. AUTHOR(*)		B. CONTRACT OR GRANT NUMBER(*) .			
Richard G. Hasenbein					
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK JUIT NUMBERS AMCMS No. 612603H 180011			
U.S. Army Armament Research & Devel	•				
Benet Weapons Laboratory, DRDAR→LCB Watervliet, NY 12189	3∽TL	PRON No. 1A-8-AZ823-NMLC			
11. CONTROLLING OFFICE NAME AND ADDRESS		12. REPORT DATE			
U.S. Army Armament Research & Devel		June 1981			
Large Caliber Weapon Systems Labora	itory	13. NUMBER OF PAGES			
Dover, NJ 07801		71			
14. MONITORING AGENCY NAME & ADDRESS(If different	from Controlling Office)	1S. SECURITY CLASS. (of thie report)			
		UNCLASSIFIED			
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE			
16. DISTRIBUTION STATEMENT (of thie Report)					
Distribution limited to US Governme evaluation; June 1981. Other reque Commander, ARRADCOM, ATTN: Benet Watervliet Arsenal, Watervliet, N. 17. DISTRIBUTION STATEMENT (of the ebetract entered to the experience of the electric entered to the elect	ests for this do Weapons Laborato Y. 12189.	cument must be referred to ry, DRDAR-LCB-DS,			
18. SUPPLEMENTARY NOTES					
·					
19. KEY WORDS (Continue on reverse side if necessary and	d identify by block number,				
Liquid Propellants		Ignition			
Liquid Propellant Guns	2	Combustion Combustion Instability			
Regenerative Liquid Propellant Guns Otto Fuel II	3	Combustion instability			
20. ABSTRACT (Continue on reverse side if recessary and	I identify by block number				
A 40 mm Regenerative Injection Liquidesigned, manufactured, and tested Laboratory, a division of the Large of the U.S. Army Armament Research objective was to develop a regenerabase within the ARRADCOM community	uid Propellant T under the direc Caliber Weapon and Development ative liquid pro	est Fixture has been tion of Benet Weapons Systems Laboratory (LCWSL) Command (ARRADCOM). The pellant gun (RLPG) technology			

20. ABSTRACT (CONT'D)

reproducibility of RLPG's in a 40 mm caliber.

A description of the fixture hardware, operation, and testing is provided. Critical areas which were identified and dealt with included material compatibility of sliding parts, projectile shot start pressure, ignition delay, combustion instability, and piston damping.

Considerable effort was expended in identifying and dealing with an acoustic combustion instability in the first tangential mode. The remedial approach which attenuated the instability was to machine five circumferential grooves on the face of the regenerative piston in the region of the injectors. This had the effect of simultaneously providing baffles and altering the injection "spray". The results show that although combustion instability is possible in an RLPG environment, it can be dealt with simply by using mechanical devices which are a direct extension of existing liquid propellant rocket technology.

Recommendations for future testing using this fixture are included.

SECURITY CLASSIFICATION OF THIS PAGE (when Date Entered)	
REPORT DOCUMENTATION PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
T. REPORT NUMBER 2. GOVT ACCESSION NO. ARLCB-TR-81027	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) STRESS INTENSITY FACTORS FOR RADIAL CRACKS IN A PARTIALLY AUTOFRETTAGED THICK-WALL CYLINDER	5. TYPE OF REPORT & PERIOD COVERED 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(*) S. L. Pu and M. A. Hussain	8. CONTRACT OR GRANT NUMBER(*)
9. PERFORMING ORGANIZATION NAME AND ADDRESS US Army Armament Research & Development Command Benet Weapons Laboratory, DRDAR-LCB-TL Watervliet, NY 12189	AMCMS No. 611102H600011 DA Project No. 1L161102AH60 PRON No. 1A0215601A1A
US Army Armament Research & Development Command Large Caliber Weapon Systems Laboratory Dover, NJ 07801	12. REPORT DATE July 1981 13. NUMBER OF PAGES 33
14. MONITORING AGENCY NAME & ADDRESS(If different from Controlling Office)	UNCLASSIFIED ISA. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of thie Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Presented at Fourteenth National Symposium on Fracture Mechanics, UCLA, Los Angeles, CA, 29 June - 1 July 1981. To be published in ASTM Special Technical Publication.

19. KEY WORDS (Continue on reverse eids if necessary and identify by block number)
Stress Intensity Factors Wei

Multiple Cracks

Weight Function Load Relief Factor

Thick-Wall Cylinder

Fracture Mechanics

Quadrilateral Isoparametric Element

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)
Using a finite element method and thermal simulation, stress intensity factors are determined for a uniform array of equal depth radial cracks emanating from the internal boundary of a pressurized, autofrettaged thick-wall cylinder.

Computations of the stress intensity factors by methods of load relief and weight function are also examined. The combination of finite elements and (CONT'D ON REVERSE)

20. ABSTRACT (CONT'D)

weight functions is found very effective and is used in this report for multiple-radial cracks in a partially autofrettaged tube.

Extensive numerical results are presented for a cylinder having an external diameter twice that of the internal diameter. It is shown that the autofrettaged tube with two diametrically opposed cracks remains, in general, the weakest configuration. For more than two cracks, the higher the number of cracks is, the smaller the stress intensity factor will be.

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM		
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER		
ARLCB-TR-81028				
4. TITLE (and Subtitie)		5. TYPE OF REPORT & PERIOD COVERED		
STRUCTURAL ANALYSIS OF A KINETIC E	NERGY			
PROJECTILE DURING LAUNCH		A REPERPUTATION OF REPORT NUMBER		
		6. PERFORMING ORG. REPORT NUMBER		
7. AUTHOR(e)		8. CONTRACT OR GRANT NUMBER(*)		
G. A. Pflegl, J. H. Underwood, and	G. P. O'Hara			
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS		
US Army Armament Research & Develo	oment Command			
Benet Weapons Laboratory, DRDAR-LO	-	AMCMS No. 4111.16.2991.0		
Watervliet, NY 12189		PRON No. 1A-9-39362-0		
11. CONTROLLING OFFICE NAME AND ADDRESS	_	12. REPORT DATE		
US Army Armament Research & Develo		July 1981		
Large Caliber Weapon Systems Labor Dover, NJ 07801	ratory	13. NUMBER OF PAGES		
14. MONITORING AGENCY NAME & ADDRESS(If differen	t from Controlling Office)	15. SECURITY CLASS. (of this report)		
		UNCLASSIFIED		
		154. DECLASSIFICATION/DOWNGRADING SCHEDULE		
16. DISTRIBUTION STATEMENT (of this Report)				
Approved for public release; dist	ribution unlimite	ed.		
17. DISTRIBUTION STATEMENT (of the abetract entered	in Block 20, if different fro	m Report)		
		`		
		·		
18. SUPPLEMENTARY NOTES				
1				
19. KEY WORDS (Continue on reverse side if necessary at	nd identify by block number))		
Penetrator				
Sabot				
Stress				
Fracture				
20. ABSTRACT (Continue on reverse side if necessary an	d identify by block number)			
This paper presents the results of				
structural integrity of a long room	_			
launch. The first phase used the	finite elment me	thod to investigate the two		
body problem of penetrator and sal				
of the analysis considered the eff	fect of pressure	loading, body forces, and		
different moduli to determine an e	estimate of the s	cresses present in the (CONT D ON REVERSE)		
1				

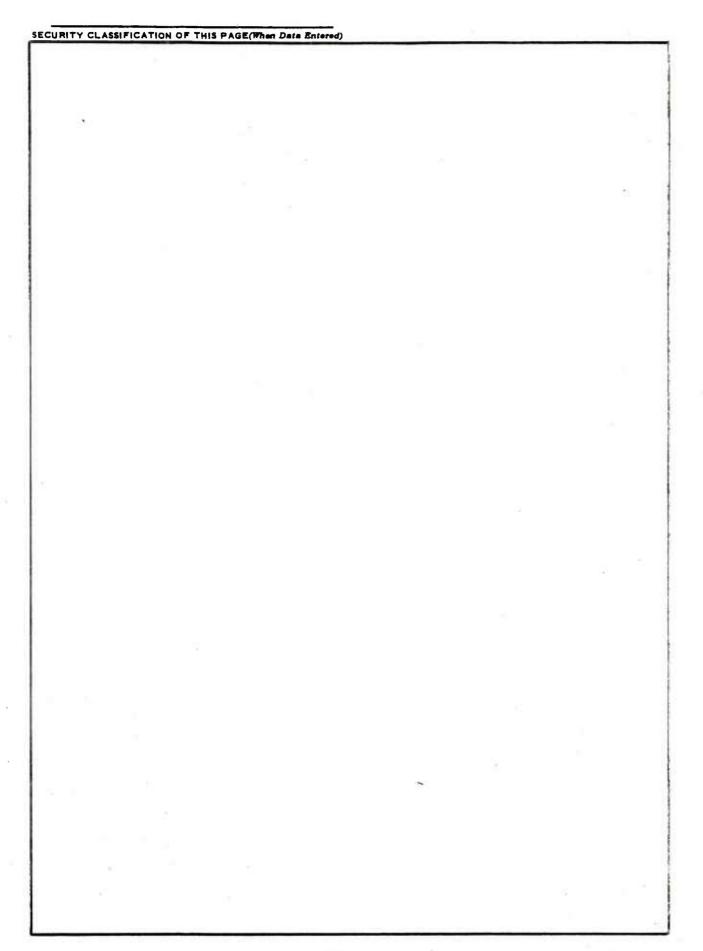
20. ABSTRACT (CONT'D)

penetrator and sabot - particularly along the intersection between the two. These stresses were then used to determine the load transfer between the penetrator and sabot.

The second phase of the effort applied the load transfer from phase one to a detailed finite element model of the thread-like lugs of the penetrator in order to determine the stress concentrations in the notch root area between the lugs. This portion of the work took into account the geometry, material properties, and load transfer of the lugs. The resulting stresses due to the shearing and bending loads and contact friction were analyzed to determine the location and magnitude of the largest tensile stresses at the surface of the lug root.

The value of maximum tensile stress in the root of the penetrator lugs was then used in a fracture mechanics analysis to determine a critical flow size which would cause brittle fracture. Using fracture toughness measurements from depleted uranium penetrator materials, critical flaw sizes were calculated and used to determine the likelihood of failure during launch and to formulate NDT inspection standards.

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM			
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER			
ARLCB-TR-81029					
4. TITLE (and Subtitle)		5. TYPE OF REPORT & PERIOD COVERED			
LOW FREQUENCY INDUCTION HEATING OF DIAMETER STEEL PREFORMS FOR ROTARY	LARGE				
DIAMETER STEEL PREFORMS FOR ROTART	FURGING	6: PERFORMING ORG. REPORT NUMBER			
David Concordia		8. CONTRACT OR GRANT NUMBER(*)			
David Concordia					
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS			
US Army Armament Research & Develor Benet Weapons Laboratory, DRDAR-LC		AMCMS No. 3291.06.7328			
Watervliet, NY 12189	D-1L	PRON No. M7-4-P4727-M7-1A			
11. CONTROLLING OFFICE NAME AND ADDRESS		12. REPORT DATE			
US Army Armament Research & Develo		July 1981			
Large Caliber Weapon Systems Labora Dover, NJ 07801	atory	13. NUMBER OF PAGES 42			
14. MONITORING AGENCY NAME & ADDRESS(II differen	t from Controlling Office)	15. SECURITY CLASS. (of this report)			
		UNCLASSIFIED			
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE			
·		SCHEDULE			
16. DISTRIBUTION STATEMENT (of thie Report)					
Approved for public release; distr	ibution unlimite	d.			
17. DISTRIBUTION STATEMENT (of the abstract entered	in Block 20. If different fro	m Report)			
18. SUPPLEMENTARY NOTES					
19. KEY WORDS (Continue on reverse side if necessary an	d identify by block number)				
Induction Heating					
Magnetic Field					
Magnetic Flux Preforms					
Rotary Forge					
20. ABSTRACT (Continue on reverse side if necessary and	Lidentify by blook number)				
Part I of this report surveys the I	pasic theory of	induction heating and			
heat flow in an inductively heated					
induction heating system now in use	e at the Watervl				
the theory of Part I to this system	n.	,			
		13			



REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM			
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER			
ARLCB-SP-81030					
4. TITLE (and Subtitle)		S. TYPE OF REPORT & PERIOD COVERED			
INDEX TO BENET WEAPONS LABORATORY	(LCWSL)				
TECHNICAL REPORTS - 1980		6. PERFORMING ORG. REPORT NUMBER			
7. AUTHOR(•)		8. CONTRACT OR GRANT NUMBER(*).			
R. D. Neifeld					
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS			
U.S. Army Armament Research & Deve		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			
Benet Weapons Laboratory, DRDAR-LC Watervliet, NY 12189	B-IL				
11. CONTROLLING OFFICE NAME AND ADDRESS		12. REPORT DATE			
U.S. Army Armament Research & Deve		July 1981			
Large Caliber Weapon Systems Labor	atory	13. NUMBER OF PAGES			
Dover, NJ 07801 14. MONITORING AGENCY NAME & ADDRESS(If different	t from Controlling Office)	113 15. SECURITY CLASS. (of this report)			
14. MONITORING AGENCY NAME & ADDRESS, I differen	i non comonnig onico)	lan seeding a seeding			
		UNCLASSIFIED			
		ISA. DECLASSIFICATION/DOWNGRADING SCHEDULE			
16. DISTRIBUTION STATEMENT (of this Report)					
16. DISTRIBUTION STATEMENT (OF the Report)					
Approved for public release; distr	ribution unlimite	d.			
		at a			
17. DISTRIBUTION STATEMENT (of the ebetract entered	in Block 20, if different fro	om Report)			
18. SUPPLEMENTARY NOTES					
L.					
19. KEY WORDS (Continue on reverse side if necessary a	nd identify by block number)			
Benet Weapons Laboratory					
Technical Publications					
Bibliography .					
Abstracts Document Control Data					
20. ABSTRACT (Continue on reverse side if necessary and	nd identify by block number))			
		tachainel memorts			
This is a compilation of Benet Wes	apons Laboratory	technical reports			
published during 1980.					
2 II E					
31					

ECURITY CLASSIFICATION OF THIS PAGE(When Date En	rerea)
2	
	.10
(A)	
**	
*	
, 4	
	2
280	a

REPORT DOCUMENT	READ INSTRUCTIONS BEFORE COMPLETING FORM	
I. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
ARLCB-TR-81031		
I. TITLE (and Subtitle)	TROATIONS HINDER	S. TYPE OF REPORT & PERIOD COVERED
NUMERICAL SOLUTION TO BEAM V A MOVING COUPLE	IBRAILONS UNDER	
A NOVING COOLDE		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(e)		8. CONTRACT OR GRANT NUMBER(*)
J. J. WU		
PERFORMING ORGANIZATION NAME AND	ADDRESS	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS AMCMS No. 611102H600011
US Army Armament Research &	-	PRON No. 1A1283121A1A
Benet Weapons Laboratory, D Watervliet, NY 12189	KDAK-LCD-1L	FRON NO. TATZOSTZTATA
1. CONTROLLING OFFICE NAME AND ADD	RESS	12. REPORT DATE
US Army Armament Research &	Development Command	August 1981
Large Caliber Weapon System	s Laboratory	13. NUMBER OF PAGES
Dover, NJ 07801		29
14. MONITORING AGENCY NAME & ADDRES	S(if different from Controlling Office)	15. SECURITY CLASS. (of this report)
		UNCLASSIFIED
		15. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of thie Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the obstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Presented at the U.S. Army Numerical Analysis and Computer Conference, Huntsville, AL, 26-27 Feb 81.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Moving Load

Beam Vibrations

Finite Element

Gun Dynamics

Projectile Eccentricity

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The finite element solution formulation in time- and space-coordinates is extended to beam vibrations effected by a moving couple. This problem has direct application to gun motions analysis with an unbalanced moving projectile. The moving load, instead of being a time-dependent Dirac delta function as for the case of a moving concentrated force, is now the derivative of this Dirac delta function. This singular function does not present any difficulty due to (CONT'D ON REVERSE)

81

DD 1 JAN 73 1473

EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE(When Date Entered)	
20. ABSTRACT (CONT'D)	
the variational process employed. This solution procedure is descr with results of beam motions subjected to a couple moving with vari	ibed together ous speeds.
	ï
	. **

REPORT DOCUMENTATION	READ INSTRUCTIONS BEFORE COMPLETING FORM		
REPORT NUMBER 2. GOVT ACCES		3. RECIPIENT'S CATALOG NUMBER	
ARLCB-TR-81032			
. TITLE (and Subtitie)		5. TYPE OF REPORT & PERIOD COVERED	
SAFE SERVICE LIFE TESTING OF THE 1	55 MM M185		
HOWITZER BARREL WITH M203 PROPELLI			
		6. PERFORMING ORG. REPORT NUMBER	
AUTHOR(•)		8. CONTRACT OR GRANT NUMBER(*)	
Bruce B. Brown and Howard D. McAlor	nie		
PERFORMING ORGANIZATION NAME AND ADDRESS	S	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS	
US Army Armament Research & Develop	pment Command	AMCMS No. 3111162223	
Benet Weapons Laboratory, DRDAR-LC	B-TL	PRON No. 1A0204811A1A	
Watervliet, NY 12189			
1. CONTROLLING OFFICE NAME AND ADDRESS	_	12. REPORT DATE	
US Army Armament Research & Develo	•	August 1981	
Large Caliber Weapon Systems Labora	atory	13. NUMBER OF PAGES	
Dover, NJ 07801		40	
4. MONITORING AGENCY NAME & ADDRESS(If differen	nt from Controlling Office)	15. SECURITY CLASS. (of thie report)	
		UNCLASSIFIED	
		15a. DECLASSIFICATION/DOWNGRADING	

Distribution limited to US Government Agencies only because of test and evaluation; August 1981. Other requests for this document must be referred to Commander, ARRADCOM, ATTN: Benet Weapons Laboratory, DRDAR-LCB-RM, Watervliet Arsenal, Watervliet, N. Y. 12189.

17. DISTRIBUTION STATEMENT (of the abetract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse elde if necessary and identify by block number)

Howitzer 155 MM M185 Fatigue Test Fatigue Life Fracture Toughness Fatigue Failure

Cannon Safe Service Life
Barrel Fatigue Crack

Tube Propelling Charge 155 mm M203

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

A fatigue study has been made of the 155 mm M185 barrel operating at M203 propelling charge pressure to assess the safe fatigue life and determine failure locations and modes. Two regions were tested: the origin of rifling which proved critical, and the bore evacuator. Reliability factors were determined and a safe service life recommended.

SECURITY CLASSIFICAT	TION OF THE	S PAGE(When	Data Entered)				
				20			
							i)
		22					
€:							
						-	2.
				(1)	6		
							- 1
						41	*

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM		
1. REPORT NUMBER 2. GOVT ACCESSION NO.		3. RECIPIENT'S CATALOG NUMBER		
ADICO TO 01077				
ARLCB-TR-81033 4. TITLE (and Subtitle)	<u> </u>	S. TYPE OF REPORT & PERIOD COVERED		
PROCESS AND PROCEDURE GUIDE FOR THE	"PUMP THRU"			
METHOD OF CHROMIUM PLATING 120 MM X	M256 GUN			
BORES		6. PERFORMING ORG. REPORT NUMBER		
7. AUTHOR(a)		8. CONTRACT OR GRANT NUMBER(*)		
G. D'Andrea, V. P. Greco, and J. Wa	lden			
·		The state of the s		
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS		
US Army Armament Research & Develop		AMCMS No. 32970672130		
Benet Weapons Laboratory, DRDAR-LCE Watervliet, NY 12189	2-17	PRON No. 1A9241411A1A		
11. CONTROLLING OFFICE NAME AND ADDRESS		12. REPORT DATE		
US Army Armament Research & Develop		October 1981		
Large Caliber Weapon Systems Labora	itory	13. NUMBER OF PAGES 90		
Dover, NJ 07801 14. MONITORING AGENCY NAME & ADDRESS(If different	nt from Controlling Office)	15. SECURITY CLASS. (of this report)		
		UNCLASSIFIED		
		154. DECLASSIFICATION/DOWNGRADING SCHEDULE		
16. DISTRIBUTION STATEMENT (of this Report)				
Distribution limited to US Governme	ent Agencies only	hecause of proprietary		
Distribution limited to US Government Agencies only because of proprietary information; October 1981. Other requests for this document must be				
referred to Commander, ARRADCOM, ATTN: Benet Weapon				
Watervliet Arsenal, Watervliet, N.Y. 12189.				
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different fr		m Report)		
		75		
18. SUPPLEMENTARY NOTES				
19. KEY WORDS (Continue on reverse side if necessary and identify by block number)				
Plating Guns				
Chromium Pump Thru"				
Controller Computer				
Process Large Caliber				
Microprocessor 20. ABSTRACT (Continue on reverse side if necessary and identify by block number)				
The "pump thru" plating system to chromium plate large caliber guns is				
described. Included in this report are: a detailed explanation of the "pump				
thru" prototype plating facility, process equipment used, related specifica-				

(CONT'D ON REVERSE)

tion requirements, and the process procedure for chromium plating the 120 mm

85

cannon tube and chamber.

REPORT DOCUMENTATION PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
	ACCESSION NO. 3. RECIPIENT'S CATALOG NUMBER
ARLCB-TR-81034 TITLE (and Subtrict) A NEW VARIATIONAL METHOD FOR INITIAL VALUE PROBLEMS, USING PIECEWISE HERMITE POLYNOMI	•
PLINE FUNCTIONS	6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(•) C. N. Shen Julian J. Wu	8. CONTRACT OR GRANT NUMBER(#)
D. PERFORMING ORGANIZATION NAME AND ACCRESS JS Army Armament Research & Development Co Benet Weapons Laboratory, DRDAR-LCB-TL Vatervliet, NY 12189	ommand 10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS AMCMS No. 611102H600011 PRON No. 1A1283121A1A
1. CONTROLLING OFFICE NAME AND ADORESS US Army Armament Research & Development Co Large Caliber Weapon Systems Laboratory Dover, NJ 07801 14. MONITORING AGENCY NAME & ADDRESS(II different from Con	13. NUMBER OF PAGES
·	UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. OISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. OISTRIBUTION STATEMENT (of the abetract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Presented at the US Army Numerical Analysis & Computers Conference, Huntsville, AL, 26-27 Feb 81.

19. KEY WOROS (Continue on reverse side if necessary and identify by block number)

Variational Principle
Initial Value Problems
Bilinear Concomitant

Spline Function
Finite Element

Recursive Solutions

Adjoint System Far End Value

20. ABSTRACT (Continue on reverse side if necessary and identity by block number)

A variational principle for a functional can be found which satisfies both the original system and its adjoint system. The variations of this functional give no boundary terms if the bilinear concomitant of the systems vanishes. For a second order time varying initial value problem, one can adjust the boundary conditions of the adjoint system in terms of the boundary conditions of the original system so that the bilinear concomitant is identically zero. (CONT'D ON REVERSE)

20. ABSTRACT (Cont'd)

An expression for the variation of the functional is derived which contains only the terms involving the variations of the adjoint variable and its derivative, but no variation of its second derivative. The variations of the adjoint variable and its derivative are found to be zeroes at the final conditions, just as the variations of the original variable and its derivative are zero at the starting (initial) conditions. This implies that we are able to solve the problem in one direction without worrying about the conditions at the other end as the initial value problem should be. The algorithm is much more simplified than in the past. An example is given to show the procedures of this new variational method.

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM	
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER	
ARLCB-TR-81035			
A. TITLE (and Subtitle)	NT 700 0000	5. TYPE OF REPORT & PERIOD COVERED	
ACTIVATION OF SUPERALLOYS AND STAI FOR CHROMIUM PLATING	NLESS STEELS	FINAL	
TOR GIROFIET FLATING			
		6. PERFORMING ORG. REPORT NUMBER	
7. AUTHOR(s)		8. CONTRACT OR GRANT NUMBER(*)	
W. Baldauf			
E. S. Chen			
9. PERFORMING ORGANIZATION NAME AND ADDRES	•	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS	
US Army Armament Research & Development Command		AMCMS No. 611102T1600011	
Benet Weapons Laboratory, DRDAR-LC Watervliet, NY 12189	D-IT	DA Project No. 1L161102AH60	
	W	PRON No. 1A0215601A1A	
1. CONTROLLING OFFICE NAME AND ADDRESS US Army Armament Research & Develo	mont Command	12. REPORT DATE	
-	-	August 1981	
Large Caliber Weapon Systems Laboratory		13. NUMBER OF PAGES	
Dover, NJ 07801		13	
14. MONITORING AGENCY NAME & ADDRESS(If different	ent from Controlling Office)	15. SECURITY CLASS. (of this report)	
		UNCLASSIFIED	
		15a, DECLASSIFICATION/DOWNGRADING SCHEDULE	

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Presented at Symposium on Plating on Difficult to Plate Metals, New Orleans, LA, 30-31 October 1980.

Published in proceedings of the symposium.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Activation

Electrodeposition

Adhesion

Stainless Steel

Chromium Plating

Superalloys

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The adhesion of electrodeposited chromium on cobalt, nickel and iron-nickel based superalloys such as CG-27, Haynes alloy 25, and Udimet 700, as well as stainless steels was investigated. A number of pretreatments were used to activate these alloys. The results show that a hydrofluoric-sulfuric acid pretreatment used anodically produces excellent adhesion. A qualitative adhesion test, named the "Groove Test" was developed to evaluate the adhesion of thick deposits of chromium on metallic substrates. The development of this test is described.

DD 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED

1(90)		
		5
	× .	
		920
		£
		\$)
		禁

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM	
. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER	
ARLCB-TR-81036			
. TITLE (and Subtitle)		5. TYPE OF REPORT & PERIOD COVERED	
AUTOMATED PLATING OF LARGE CALIBER	GUNS -		
APPLICATION OF COMPUTER CONTROL TO	"PUMP THRU"		
PLATING SYSTEMS		6. PERFORMING ORG. REPORT NUMBER	
· AUTHOR(e)		8. CONTRACT OR GRANT NUMBER(*)	
Joseph A. Walden			
PERFORMING ORGANIZATION NAME AND ADDRES	is.	10. PROGRAM FLEMENT PROJECT TASK	
		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS	
US Army Armament Research & Development Command Benet Weapons Laboratory, DRDAR-LCB-TL Watervliet, NY 12189		AMCMS No. 32970672130	
		PRON No. 1A9241411A1A	
1. CONTROLLING OFFICE NAME AND ADDRESS		12. REPORT DATE	
US Army Armament Research & Develo	pment Command	September 1981	
Large Caliber Weapon Systems Labor		13. NUMBER OF PAGES	
Dover, NJ 07801		198	
4. MONITORING AGENCY NAME & ADDRESS(If ditter	ent from Controlling Office)	15. SECURITY CLASS. (of thie report)	
		UNCLASSIFIED	
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE	

16. DISTRIBUTION STATEMENT (of this Report)

Distribution limited to US Government Agencies only because of proprietary information; September 1981. Other requests for this document must be referred to Commander, ARRADCOM, ATTN: Benet Weapons Laboratory, DRDAR-LCB-RP, Watervliet Arsenal, Watervliet, N. Y. 12189.

17. DISTRIBUTION STATEMENT (of the abetract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reveree elde if necessary and identify by block number)

Plating

"Pump Thru"

Chromium

Computer

Controller

Large Caliber

Process

Microprocessor

Guns

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Computerized control of the "pump thru" plating system to chromium plate large caliber guns is described. Included in this report are: circuit diagrams of interfacing electrical hardware; ladder diagrams and memory address records; a detailed explanation of program operation, and a software stepper switch whose function can be automatically or manually controlled.

(CONT'd ON REVERSE)

20. ABSTRACT (Cont'd)

The study shows the ready availability of program substitution, accommodation of complex plating processes, and removal of manual restraints through automation. Typical chromium plating results of several 120 mm XM256 gun barrels are presented to show the capability of the automated "pump thru" facility. These results have arisen from increased monitoring and control capabilities, essential needs for the automated factory.

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM	
ARLCB-TR-81037	GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER	
TITLE (and Subtitio) FATIGUE PERFORMANCE COMPARISON OF ROAND CONVENTIONALLY FORGED CANNON BAS (105 MM M68)	DETC	5. TYPE OF REPORT & PERIOD COVERED Final 6. PERFORMING ORG. REPORT NUMBER	
Bruce B. Brown and Howard D. McAloni	ie	8. CONTRACT OR GRANT NUMBER(#)	
PERFORMING ORGANIZATION NAME AND ADDRESS US Army Armament Research & Develope Benet Weapons Laboratory, DRDAR-LCB- Watervliet, NY 12189		10. PROGRAM ELEMENT PROJECT, TASK AREA & WORK UNIT NUMBERS AMCMS No. 3110.15.1100 PRON No. M7-T-F1811-01-M7-1A	
US Army Armament Research & Development Command Large Caliber Weapon Systems Laboratory Dover, NJ 07801 14. MONITORING AGENCY NAME & AGGRESS(If different from Controlling Office)		12. REPORT OATE September 1981 13. NUMBER OF PAGES 41 15. SECURITY CLASS. (of this report) UNCLASSIFIED	
5. OISTRIBUTION STATEMENT (of this Report)		15. DECLASSIFICATION/DOWNGRADING SCHEDULE	

Distribution limited to US Government Agencies only because of test and evaluation; September 1981. Other requests for this document must be referred to Commander, ARRADCOM, ATTN: Benet Weapons Laboratory, DRDAR-LCB-RM, Watervliet Arsenal, Watervliet, N. Y. 12189.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WOROS (Continue on reverse eide if necessary and identify by block number)

Fatigue

Fracture Toughness

Rotary Forge

105 mm M68

Press Forge

Fatigue Test

Cannon Barrel

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Three 105 mm M68 barrels — two formed by the new rotary forge process at Watervliet Arsenal and one formed by the conventional forging process — were fired beyond the assigned safe life and hydraulically cycled to fatigue failure. Fracture toughness, mechanical property, and metallurgical evaluations were made to characterize the material. Test data was evaluated and compared with previous fatigue data on this barrel. No significant difference in fatigue performance or mechanical properties is noted between the two forging methods.

			¥8
*:			
			100
			*0
			3
DE.	*		
			E .
			55
		17	
			2.00

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM	
. REPORT NUMBER 2	. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER	
ARLCB-TR-81038			
4. TITLE (and Subtitio) ELASTIC-PLASTIC THICK-WALLED TUBES SUBJECTED TO INTERNAL PRESSURE AND TEMPERATURE GRADIENT		S. TYPE OF REPORT & PERIOD COVERED Final 6. PERFORMING ORG. REPORT NUMBER	
P. C. T. Chen		8. CONTRACT OR GRANT NUMBER(*)	
US Army Armament Research & Develope Benet Weapons Laboratory, DRDAR-LCB- Watervliet, NY 12189		10. PROGRAM ELEMENT PROJECT, TASK AREA & WORK UNIT NUMBERS AMCMS No. 611102H5710011 DA Project No. 1L161102BH57 PRON No. 1A1235821A1A	
US Army Armament Research & Develop Large Caliber Weapon Systems Labora Dover, NJ 07801		12. REPORT DATE September 1981 13. NUMBER OF PAGES 18	
14. MONITORING AGENCY NAME & ADDRESS(if different	from Controlling Office)	15. SECURITY CLASS. (of this report) UNCLASSIFIED 15. DECLASSIFICATION/DOWNGRADING SCHEDULE	

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the ebetract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Presented at 27th Conference of Army Mathematicians, US Military Academy, West Point, NY, 10-12 June 1981. Published in proceedings of the conference.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Elastic-Plastic

Thick-Walled Tube

Finite-Difference Method

Internal Pressure

Temperature Gradient

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Using von Mises' criterion and the Prandtl-Reuss flow theory, numerical solutions are obtained for the stresses, strains, and displacements in an elastic-plastic thick-walled tube subjected to internal pressure and temperature gradient. The material is based on the incremental finite-difference method in conjunction with a scaled loading approach. All incremental quantities are determined in the program and no iteration is needed. The approach is simpler than others yet quite general and accurate.

95

	ATION OF THIS PAGE(When Data En			
*				
		e:		
				- 12
			8.1	
		.5*		
			20	
				10
	2			
			-	
Y			2	

REPORT DOCUMENTATION PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM	
1. REPORT NUMBER 2. GOVT ACCESSIO		
ARLCB-TR-81039		
4. TITLE (and Subtitie)	5. TYPE OF REPORT & PERIOD COVERED	
FABRICATION AND CHARACTERIZATION OF TUNGSTEN		
WIRE REINFORCED U-0.75 T1 ALLOY COMPOSITES	Final	
	6. PERFORMING ORG. REPORT NUMBER	
7. AUTHOR(*)	8. CONTRACT OR GRANT NUMBER(*)	
I. Ahmad, J. Barranco, (Cont'd on Reverse)		
9. PERFORMING ORGANIZATION NAME AND ADDRESS	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS	
US Army Armament Research & Development Command Benet Weapons Laboratory, DRDAR-LCB-TL	AMCMS No. 692000.071.0012	
Watervliet, NY 12189	PRON No. 1A1263841ANF	
11. CONTROLLING OFFICE NAME AND ADDRESS	12. REPORT OATE	
US Army Armament Research & Development Command		
Large Caliber Weapon Systems Laboratory	13. NUMBER OF PAGES	
Dover, NJ 07801	31	
14. MONITORING AGENCY NAME & AODRESS(it different from Controlling O.	ffice) IS. SECURITY CLASS. (of this report)	
	UNCLASSIFIED	
	15a. OECLASSIFICATION/DOWNGRADING SCHEOULE	
	SCHEOULE	
Distribution STATEMENT (of this Report) Distribution limited to US Government Agencies evaluation; Sept. 1981. Other requests for the to Commander, ARRADCOM, ATTN: Benet Weapons Lawrence Watervliet, NY 12189.	nis document must be referred	
waterviret, it izioy.		
17. DISTRIBUTION STATEMENT (of the abetract entered in Block 20, if different	rent from Report)	
18. SUPPLEMENTARY NOTES		
3. 3		
19. KEY WORDS (Continue on reverse elde if necessary and identify by block	number)	
	inforcement	
	omposites	
	extrusion	
	(mah ca)	
20. ABSTRACT (Continue on reverse state of necessary and identify by block of Composites of U-0.75 Ti reinforced with 0.56 V _f		
fabricated by hydrostatically extruding alloy h	illets containing seven VM-E	
grade 6.2 mm (0.245 in.) diameter tungsten rods positioned in a hexagonally		
close-packed arrangement. Runs were made at 500°C and 600°C at an extrusion		
ratio of 9:1 to achieve nominally 9.6 mm (0.38 in.) diameter rod stock, which		
was machined into tensile, bend, compression, a	and Taylor specimens.	
	(CONT'D ON REVERSE)	

DD 1 JAN 73 1473

7. AUTHORS (Cont'd)

- R. J. Fiorentino Battelle Memorial Institute Columbus, OH
- J. Mescall, G. Bishop US Army Materials and Mechanics Research Center Watertown, MA
- E. Roecker
 US Army Armament Research and Development Command
 Ballistics Research Laboratory
 Aberdeen, MD

20. ABSTRACT (Cont'd)

Metallurgical examination of the transverse sections of the extruded specimens showed no detectable porosity or filament-matrix interaction. Mechanical property including Taylor test data are presented along with a disucssion of the failure modes observed in these various tests.

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM	
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER	
ARLCB-TR-81040			
A. TITLE (and Subtitle)	OVERI OARER	5. TYPE OF REPORT & PERIOD COVERED	
ON ELASTIC-PLASTIC ANALYSIS OF AN BREECH RING USING NASTRAN	OVERLOADED	Final	
		6. PERFORMING ORG. REPORT NUMBER	
7. AUTHOR(*) P. C. T. Chen		8. CONTRACT OR GRANT NUMBER(*)	
US Army Armament Research and Deve Benet Weapons Laboratory, DRDAR-LC Watervliet, NY 12189	-	10. PROGRAM ELEMENT PROJECT, TASK AREA & WORK UNIT NUMBERS AMCMS No. 611102H5710011 DA Project No. 1L161102BH57 PRON No. 1A1235821A1A	
1. CONTROLLING OFFICE NAME AND ADDRESS US Army Armament Research and Deve	lopment Command	12. REPORT DATE September 1981	
Large Caliber Weapon Systems Labor	atory	13. NUMBER OF PAGES	
Dover, NJ 07801		16	
14. MONITORING AGENCY NAME & ADDRESS(If different from Controlling Office)		1S. SECURITY CLASS. (of thie report)	
		UNCLASSIFIED	
		15a. DECLASSIFICATION/DOWNGRADING	

16. DISTRIBUTION STATEMENT (of thie Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abetract entereds Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

To be presented at Tenth NASTRAN Users' Colloquium, NASA/Jet Propulsion Lab, Pasadena, California, 7-9 October 1981.

To be published in proceedings of the colloquium.

19. KEY WORDS (Continue on reverse side if necessary and identity by block number)

Elastic-Plastic

Breech Ring

Finite Element

NASTRAN Code

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The piece-wise linear analysis option of the NASTRAN code was used to analyze a photoplastic model for sliding breech mechanism. A two-dimensional finite element representation for the breech ring was chosen and the material was made of polycarbonate resin. The aluminum block was regarded as rigid and the width of contact was assumed to remain unchanged during loading. The displacements and stresses in the breech ring were obtained for loading in (CONT'D ON REVERSE)

20. ABSTRACT (CONT'D)		
the elastic as well as plastic range. The and after complete unloading were obtained experimental results.	maximum tensile s and compared with	tresses before numerical and
•		·
14		

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

REPORT DOCUMENTATION PAGE	=	READ INSTRUCTIONS
	VT ACCESSION NO.	BEFORE COMPLETING FORM 3. RECIPIENT'S CATALOG NUMBER
ARLCB-TR-81041		S. TYPE OF REPORT & PERIOD COVERED
FRACTURE TOUGHNESS OF 105mm M68 TUBES		Final
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(e)		8. CONTRACT OR GRANT NUMBER(#)
F. A. Heiser		
US Army Armament Research and Developm Benet Weapons Laboratory, DRDAR-LCB-TL Watervliet, NY 12189	ent Command	10. PROGRAM ELEMENT PROJECT, TASK AMCMS No. 3211.16.0011.6 PRON No. 1A-9-39347-NMLC
US Army Armament Research and Developm	ent Command	October 1981
Large Caliber Weapon Systems Laborator Dover, NJ 07801	у	13. NUMBER OF PAGES 92
14. MONITORING AGENCY NAME & ADDRESS(If different from	Controlling Office)	15. SECURITY CLASS. (of thie report)
		UNCLASSIFIED
		15. DECLASSIFICATION/DOWNGRADING SCHEDULE
Distribution STATEMENT (of this Report) Distribution limited to US Government evaluation; October 1981. Other reque to Commander, ARRADCOM, ATTN: Benet W Watervliet Arsenal, Watervliet, NY 12	sts for this eapons Labor	document must be referred
17. DISTRIBUTION STATEMENT (of the ebetrect entered in Blo	ock 20, if different fro	om Report)
18. SUPPLEMENTARY NOTES		
16. SUPPLEMENTANT NOTES		
19. KEY WORDS (Continue on reverse elde if necessary and idea	ntify by block number	;)
Fracture Toughness		
Rotary Forging		
20. ABSTRACT (Continue on reverse state if necessary and iden	uify by block number	
Since fracture toughness is not usual measure K _{IC} of 105mm M68 cannon tube of steel producer, steel making techn	ly measured, forgings prod	duced by various combinations

Since fracture toughness is not usually measured, a program was initiated to measure K_{IC} of 105mm M68 cannon tube forgings produced by various combinations of steel producer, steel making technique, and forging technique. The data show that, regardless of the techniques used to produce the forging, the fracture toughness is consistently higher at the breech end than at the muzzle end, a pattern which is consistent with the Charpy V-Notch (CVN) energy which is measured as part of the acceptance testing of tube forgings. (CONT'D ON REVERSE)

DD 1 JAN 73 1473

EDITION OF 1 NOV 65 IS OBSOLETE 101

UNCLASSIFIED

20. ABSTRACT (CONT'D)

This is interpreted as a manisfestation of the increased forging reduction seen at the muzzle end.

It is also shown that fracture toughness is greatly influenced by the steel making practice and by the steel supplier, but it is not greatly affected by the forging process used. Specifically, the fracture toughness of rotary forged tubes is similar to that of conventionally press forged tubes, when the steel making practice is the same, and the forging reduction is similar. Of the mechanical properties usually measured, only CVN shows a relationship to fracture toughness. Even then, there is sufficient scatter to preclude using CVN as a predictor.

REPORT DOCUMENTATION	ON PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
ARLCB-TR-81042		
. TITLE (end Subtitie)		S. TYPE OF REPORT & PERIOD COVERED
155mm M199 FIRING TRAIN TEST		
		6. PERFORMING ORG. REPORT NUMBER
R. Fiscella R. Carroll	, , , , , , , , , , , , , , , , , , , ,	8. CONTRACT OR GRANT NUMBER(*)
· PERFORMING ORGANIZATION NAME AND ADDR US Army Armament Research and De Benet Weapons Laboratory, DRDAR- Watervliet, NY 12189	evelopment Command	10. PROGRAM ELEMENT PROJECT, TASK AREA & WORK UNIT NUMBERS AMCMS No. 32111600156 PRON No. 1A9280051A1A
1. CONTROLLING OFFICE NAME AND ADDRESS US Army Armament Research and De Large Caliber Weapon Systems Lab Dover, NJ 07801	poratory	12. REPORT DATE October 1981 13. NUMBER OF PAGES 13
4. MONITORING AGENCY NAME & ADDRESS(If dif.	ferent from Controlling Office)	UNCLASSIFIED 1S. DECLASSIFICATION/DOWNGRADING SCHEDULE

Distribution limited to US Government Agencies only because of test and evaluation; October 1981. Other requests for this document must be referred to Commander, ARRADCOM, ATTN: Benet Weapons Laboratory, DRDAR-LCB-DA, Watervliet Arsenal, Watervliet, NY 12189.

17. DISTRIBUTION STATEMENT (of the ebstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Energy

Firing Mechanism

Firing Pin

Misfire

Primer

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Due to misfire problems during the Follow-on Evaluation (FOE) of the 155mm M198 Howitzer, an investigation was initiated to determine what extent increasing the energy supplied by the M199 firing train would have on improving the system performance with marginal M82 primer lots (or with marginal M35 firing mechanisms). It was concluded that increasing the amount of energy transferred to the primer has a significant effect in lowering the misfire rate.

DD 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE 103 UNCLASSIFIED

and the same of the					
					52
	50				
574					
	¥				
**					
			721		
	1				
				92	

REPORT DOCUMENTATION PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER 2. GOVT ACCESS	ION NO. 3. RECIPIENT'S CATALOG NUMBER
ARLCB-TR-81043	
4. TITLE (end Subtitle)	S. TYPE OF REPORT & PERIOD COVERED
METHOD OF SOLUTION FOR VARIATIONAL PRINCIPLE	
USING BICUBIC HERMITE POLYNOMIAL	
× ·	5. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(e)	8. CONTRACT OR GRANT NUMBER(a)
C. N. Shen	
9. PERFORMING ORGANIZATION NAME AND ADDRESS	
	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
US Army Armament Research & Development Comman	AMCMS No. 611102H600011
Benet Weapons Laboratory, DRDAR-LCB-TL Watervliet, NY 12189	PRON No. 1A1283121A1A
11. CONTROLLING OFFICE NAME AND ADDRESS	12. REPORT DATE
US Army Armament Research & Development Comman	d November 1981
Large Caliber Weapon Systems Laboratory	13. NUMBER OF PAGES
Dover, NJ 07801	24
14. MONITORING AGENCY NAME & ADDRESS(If different from Controlling (Office) 15. SECURITY CLASS. (of thie report)
	UNCLASSIFIED
_	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
·	

16. DISTRIBUTION STATEMENT (of thie Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Presented at 27th Conference of Army Mathematicians, US Military Academy, West Point, NY, 10-12 June 1981. Published in proceedings of the conference.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Variational Principle

Spline Function

Initial-Boundary Value Problem

Recursive Solution

Bilinear Concomitant

Bicubic Hermite Polynomial

Adjoint System

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

In solving mixed boundary and initial value problems of a second order partial differential equation using spline functions, the computation may be simplified considerably if the variable in time can be truncated into arbitrary sections. Each section may have several node points for the spline functions in the time domain. This is true because we found from a previous paper that the initial value problem can be solved in one direction using variational principle and (CONT'D ON REVERSE)

DD 1 JAN 73 1473 EDIT

EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED

20. ABSTRACT (CONT'D)

cubic Hermite Polynomials, without worrying about the conditions at the other end.

The end conditions of the adjoint system can be adjusted according to the end conditions of the original system so that the bilinear concomitant is identically zero. This satisfies the variational principle. A bilinear form of the original and adjoint variables is employed in determining the coefficients of the variations of the functions and their first derivatives. There is no term involving the variations of any higher derivatives. A bicubic Hermite Polynomial spline function is used which gives continuity in the function and first partial derivatives in space or time, together with the mixed first partial derivative in space and time. Algorithm and procedure of computation are given.

REPORT DOCUMENTATION F	PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
ARLCB-TR-81044		
N. TITLE (and Subtitio) THERMO-ELASTIC-PLASTIC STRESSES IN M CYLINDERS	MULTI-LAYERED	5. TYPE OF REPORT & PERIOD COVERED
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(*)		8. CONTRACT OR GRANT NUMBER(#)
John D. Vasilakis		
PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
US Army Armament Research & Develops		AMCMS No. 6111.01.91A0.0
Benet Weapons Laboratory, DRDAR-LCB-	-TL	DA Project No. 1T161101A91A
Watervliet, NY 12189		PRON No. 1A1281501A1A
1. CONTROLLING OFFICE NAME AND ADDRESS		12. REPORT DATE
US Army Armament Research & Develops		November 1981
Large Caliber Weapon Systems Laborat	ory	13. NUMBER OF PAGES
Dover, NJ 07801		24
4. MONITORING AGENCY NAME & ADDRESS(If different	from Controlling Office)	15. SECURITY CLASS. (of thie report)
		UNCLASSIFIED
		ISA. DECLASSIFICATION/DOWNGRADING

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Presented at 27th Conference of Army Mathematicians, US Military Academy, West Point, NY, 10-12 June 1981. Published in proceedings of the conference.

19. KEY WORDS (Continue on reverse elde if necessary and identify by block number)

Thermo-Elastic-Plastic Response

Multi-Layered Cylinders

Thermal Loads

Pressure Loads

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

One of the many efforts undertaken to increase the life of gun tubes and/or increase their resistance to erosion involves the use of liners fabricated from different materials. A finite difference computer code for investigating the thermo-elastic-plastic response of gun tubes has been expanded to include multi-layered cylinder response to time dependent boundary conditions.

Considered are both cyclic heat input and cyclic stress input. Response (CONT'D ON REVERSE)

			an Date Entered)			
	ABSTRACT (Con					
The	ves from inputs emphasis in th thermo-elastic	is report is	on the tra	nsient tempe	erature respon	se and on
						1.00
						E 18

REPORT DOCUMENTATION	PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
ARLCB -TR-81045		
. TITLE (and Subtitie)		S. TYPE OF REPORT & PERIOD COVERED
SUPERCONDUCTIVITY IN HYDROGEN-CHAI	RGED	FINAL
COPPER-IMPLANTED PALLADIUM		1 11476
		6. PERFORMING ORG. REPORT NUMBER
· AUTHOR(*)		8. CONTRACT OR GRANT NUMBER(*)
A. Leiberich, W. Scholz, W. J. Sta		AMCMS NO.611102H600011
C. G. Homan (CONT'D ON REV	VERSE)	PRON No.1A1283121A1A
PERFORMING ORGANIZATION NAME AND ADDRESS	5	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
US Army Armament Research & Develo	opment Command	AREA & WORK ONLY NOMBERS
Benet Weapons Laboratory, DRDAR-LO	CB-TL	
Watervliet, NY 12189		
1. CONTROLLING OFFICE NAME AND ADDRESS		12. REPORT DATE
US Army Armament Research & Develo	opment Command	December 1981
Large Caliber Weapon Systems Labor	ratory	13. NUMBER OF PAGES
Dover, NJ 07801		10
4. MONITORING AGENCY NAME & ADDRESS(It dittered	nt from Controlling Office)	1S. SECURITY CLASS. (of this report)
		UNCLASSIFIED
		15a. DECLASSIFICATION/DOWNGRADING

16. DISTRIBUTION STATEMENT (of thie Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the obstrect entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Presented at Third Ion Beam International Meeting, Grenoble, France, September 1981. To be published in the Journal of Physics, A.

19. KEY WORDS (Continue on reverse eide if necessary and identify by block number)

Superconductivity
Ion Implantation
Palladium-Copper Hydride

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

A superconducting transition temperature, $T_{\rm C}$, of 124. K has been observed in palladium implanted with copper ions and electrolytically charged with hydrogen at dry ice temperature. A step-wise warmup procedure between 77 K and 273 K produces considerable variations in $T_{\rm C}$. Annealing the copper implanted palladium before electrolysis does not change $T_{\rm C}$ to a substantial degree.

7. AUTHOR(S)

A. Leiberich, W. Scholz, and W. J. Standish Department of Physics State University of New York at Albany Albany, NY

C. G. Homan

US Army Armament Research & Development Command Large Caliber Weapon Systems Laboratory Benet Weapons Laboratory

REPORT DOCUMENTATION	PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
ARLCB -TR-81046		
. TITLE (and Subtitle)		S. TYPE OF REPORT & PERIOD COVERED
STUDY OF EROSION RESISTANT MATERIA BORES PART III: LOW CONTRACTION		FINAL
PLATED LINERS		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(a)		8. CONTRACT OR GRANT NUMBER(a) .
R. L. Cullinan, G. D'Andrea, P. C	Croteau	12
9. PERFORMING ORGANIZATION NAME AND ADDRE	SS	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
US Army Armament Research & Devel		AMCMS No.6436280070012
Benet Weapons Laboratory, DRDAR-I	LCB-TL	PRON No. 1A1246361A1A
Watervliet, NY 12189		
11. CONTROLLING OFFICE NAME AND ADDRESS		December 1981
US Army Armament Research & Devel	Lopment Command	
Large Caliber Weapon Systems Labo	oratory	13. NUMBER OF PAGES
Dover, NJ 07801		36
50.02 10 0.002		15. SECURITY CLASS. (of thie report)
14. MONITORING AGENCY NAME & ADDRESS(II ditte	rent from Controlling Office)	
14. MONITORING AGENCY NAME & ADDRESS(II ditte	rent from Controlling Office)	Unclassified
14. MONITORING AGENCY NAME & ADDRESS(II ditte	rent from Controlling Office)	Unclassified ISO DECLASSIFICATION/DOWNGRADING SCHEDULE

Distribution limited to US Government Agencies only because of test & evaluation Dec. 1981. Other requests for this document must be referred to Commander, ARRADCOM, ATTN:Benet Weapons Laboratory, DRDAR-LCB-RP, Watervliet Arsenal. Watervliet, N.Y. 12189.

17. DISTRIBUTION STATEMENT (of the ebetract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Gun Tube Erosion Shrunk-Fit Liner Bore Plating Low Contractile Chromium Erosion Protection

20 mm M24Al Gun

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The major criteria for the condemnation of gun tubes is based on the excessive erosion of the bore which results in loss of range and accuracy. Gun tube erosion is caused by a number of severe thermal, mechanical, and chemical factors interacting during the firing cycle. One approach to minimize erosion is to line gun barrels with wear resistant materials. This work introduces LC chromium coated steel liners to reduce excessive bore erosion. Firing tests (CONT'D ON REVERSE)

DD 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE 111

UNCLASSIFIED

TECHNICAL REPORT INTERNAL DISTRIBUTION LIST

	NO. OF COPIES
COMMANDER	1
CHIEF, DEVELOPMENT ENGINEERING BRANCH ATTN: DRDAR-LCB-DA -DM -DP -DR -DS (SYSTEMS) -DS (ICAS GROUP) -DC	1 1 1 1 1 1 1 1
CHIEF, ENGINEERING SUPPORT BRANCH ATTN: DRDAR-LCB-SE -SA	1 1 1
CHIEF, RESEARCH BRANCH ATTN: DRDAR-LCB-RA -RC -RM -RP	2 1 1 1
TECHNICAL LIBRARY ATTN: DRDAR-LCB-TL	5
TECHNICAL PUBLICATIONS & EDITING UNIT ATTN: DRDAR-LCB-TL	2
DIRECTOR, OPERATIONS DIRECTORATE	1
DIRECTOR, PROCUREMENT DIRECTORATE	1
DIRECTOR, PRODUCT ASSURANCE DIRECTORATE	1

NOTE: PLEASE NOTIFY DIRECTOR, BENET WEAPONS LABORATORY, ATTN: DRDAR-LCB-TL, OF ANY REQUIRED CHANGES.

TECHNICAL REPORT EXTERNAL DISTRIBUTION LIST

	NO. OF		NO. OF
	COPIES		COPIES
ASST SEC OF THE ARMY RESEARCH & DEVELOPMENT ATTN: DEP FOR SCI & TECH THE PENTAGON WASHINGTON, D.C. 20315	1	COMMANDER US ARMY TANK-AUTMV R&D COMD ATTN: TECH LIB - DRDTA-UL MAT LAB - DRDTA-RK WARREN, MICHIGAN 48090	. 1
COMMANDER US ARMY MAT DEV & READ. COMD ATTN: DRCDE 5001 EISENHOWER AVE ALEXANDRIA, VA 22333	1	COMMANDER US MILITARY ACADEMY ATTN: CHMN, MECH ENGR DEPT WEST POINT, NY 10996	1
COMMANDER US ARMY ARRADCOM ATTN: DRDAR-LC -LCA (PLASTICS TECH	1	US ARMY MISSILE COMD REDSTONE SCIENTIFIC INFO CEN ATTN: DOCUMENTS SECT, BLDG 4484 REDSTONE ARSENAL, AL 35898	2
EVAL CEN) -LCE -LCM -LCS -LCW -TSS (STINFO)	1 1 1 1 2	COMMANDER REDSTONE ARSENAL ATTN: DRSMI-RRS -RSM ALABAMA 35809	1 1
DOVER, NJ 07801 COMMANDER US ARMY ARRCOM ATTN: DRSAR-LEP-L ROCK ISLAND ARSENAL ROCK ISLAND, IL 61299	1	COMMANDER ROCK ISLAND ARSENAL ATTN: SARRI-ENM (MAT SCI DIV) ROCK ISLAND, IL 61299 COMMANDER HQ, US ARMY AVN SCH ATTN: OFC OF THE LIBRARIAN	1
DIRECTOR US ARMY BALLISTIC RESEARCH LABORATORY ATTN: DRDAR-TSB-S (STINFO) ABERDEEN PROVING GROUND, MD 21005	1	FT RUCKER, ALABAMA 36362 COMMANDER US ARMY FGN SCIENCE & TECH CEN ATTN: DRXST-SD	1
COMMANDER US ARMY ELECTRONICS COMD ATTN: TECH LIB FT MONMOUTH, NJ 07703	1	220 7TH STREET, N.E. CHARLOTTESVILLE, VA 22901 COMMANDER US ARMY MATERIALS & MECHANICS	
COMMANDER US ARMY MOBILITY EQUIP R&D COMD ATTN: TECH LIB FT BELVOIR, VA 22060	1	RESEARCH CENTER ATTN: TECH LIB - DRXMR-PL WATERTOWN, MASS 02172	2

NOTE: PLEASE NOTIFY COMMANDER, ARRADCOM, ATTN: BENET WEAPONS LABORATORY, DRDAR-LCB-TL, WATERVLIET ARSENAL, WATERVLIET, N.Y. 12189, OF ANY REQUIRED CHANGES.

TECHNICAL REPORT EXTERNAL DISTRIBUTION LIST (CONT.)

	NO. OF COPIES		NO. OF COPIES
COMMANDER US ARMY RESEARCH OFFICE P.O. BOX 12211 RESEARCH TRIANGLE PARK, NC 27709 COMMANDER	1	COMMANDER DEFENSE TECHNICAL INFO CENTER ATTN: DTIA-TCA CAMERON STATION ALEXANDRIA, VA 22314	12 (2-LTD)
US ARMY HARRY DIAMOND LAB ATTN: TECH LIB 2800 POWDER MILL ROAD ADELPHIA, MD 20783	1	METALS & CERAMICS INFO CEN BATTELLE COLUMBUS LAB 505 KING AVE COLUMBUS, OHIO 43201	1
DIRECTOR US ARMY INDUSTRIAL BASE ENG ACT ATTN: DRXPE-MT ROCK ISLAND, IL 61299	1	MECHANICAL PROPERTIES DATA CTR BATTELLE COLUMBUS LAB 505 KING AVE COLUMBUS, OHIO 43201	1
CHIEF, MATERIALS BRANCH US ARMY R&S GROUP, EUR BOX 65, FPO N.Y. 09510	1	MATERIEL SYSTEMS ANALYSIS ACTV ATTN: DRXSY-MP ABERDEEN PROVING GROUND MARYLAND 21005	1
COMMANDER NAVAL SURFACE WEAPONS CEN ATTN: CHIEF, MAT SCIENCE DIV DAHLGREN, VA 22448	1		
DIRECTOR US NAVAL RESEARCH LAB ATTN: DIR, MECH DIV CODE 26-27 (DOC LIB) WASHINGTON, D.C. 20375	1		
NASA SCIENTIFIC & TECH INFO FAC P.O. BOX 8757, ATTN: ACQ BR BALTIMORE/WASHINGTON INTL AIRPORT MARYLAND 21240	1		

NOTE: PLEASE NOTIFY COMMANDER, ARRADCOM, ATTN: BENET WEAPONS LABORATORY, DRDAR-LCB-TL, WATERVLIET ARSENAL, WATERVLIET, N.Y. 12189, OF ANY REQUIRED CHANGES.